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The
WORLD UNIVERSITY ENCYCLOPEDIA
Unabridged

Volume 10

ROTHERMERE–STREET RAILWAY

AN ILLUSTRATED TREASURY OF KNOWLEDGE

Publishers Company, Inc.
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Key to Pronunciation

VOWELS

ă (short), as in *hat, cat.*
ā (long), as in *ale, hate.*
ä (Italian), as in *car, mar.*
ȧ (short Italian), as in *fast, class.*
a̤ (broad), as in *all, fall.*
â (circumflex), as in *care, snare.*
ạ or a̭ (short obscure), as in *final, spinal.*
â (long obscure), as in *surface.*
ae, as in *Caesar,* = ē.

ĕ (short), as in *net, met.*
ē (long), as in *me, eve.*
ê (circumflex = â), as in *there.*
ẽ (tilde), as in *her.*
ẹ or ę (short obscure), as in *patent.*
ê (long obscure), as in *delay.*
ė = ĭ, as in *pretty.*

ĭ (short), as in *hit, bit.*
ī (long), as in *ḳite, mite.*
ĩ (tilde), as in *sir.*
i (short obscure), as in *habit.*
î (long obscure), as in *idea.*

ŏ (short), as in *pop, hop.*
ō (long), as in *cone, bone.*
ô (circumflex = a̤), as in *for.*
ô (long obscure), as in *hero.*
ŏŏ (short), as in *booḳ, brooḳ.*
ōō (long), as in *moon, spoon.*
ọ = û, as in *word.*
ȯ = ŭ, as in *son.*
oe, as in *Phoebe,* = ē.

ŭ (short), as in *rut, cut.*
ū (long), as in *muse, fuse.*
û (circumflex), as in *turn, urn.*
û (long obscure), as in *unite.*

w is a vowel only after a vowel, when it forms the second element of certain diphthongs, as in *few, how.*

y̆ (short) = ĭ, as in *hymn.*
ȳ (long) = ī, as in *by, cry.*

CONSONANTS

ϵ (hard) = k, as in *cat, cape.*
ç (cedilla) = s, as in *cell, façade.*
ḡ (hard), as in *dog, gave.*
ġ (soft), as in *gem, gentle.*
ḳ for the German ch, as in *ich, Bach* (bäk); also = ϵ

ü for the German ü, as in *Blücher, Grünberg.*
ö for the German ö, as in *Göttingen.*
ṉ for the French n, as in *bon, Bréton (brâ-tôṉ′).*
th (soft), as in *path.*
TH (hard), as in *the, father.*
ñ for the sound of ny, as in *canyon.*

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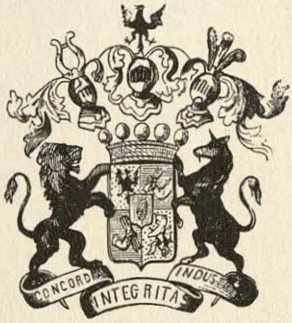
Rothermere (*rŏTH′ẽr-mẽr*), HAROLD SIDNEY HARMSWORTH, 1ST VISCOUNT, publisher, born in Hampstead, London, April 26, 1868; died in Hamilton, Bermuda, Nov. 26, 1940. With his brothers, Sir Hildebrand (1872-1929) and Sir Robert (1870-1937), Harold Harmsworth joined the newspaper publishing firm established by their older brother, Alfred, later Viscount Northcliffe (see *Harmsworth*). After Northcliffe's death, Rothermere became head of the firm. He owned several newspapers independently and founded the *Sunday Pictorial* in 1915. He was created Viscount Rothermere in 1919, following his war service as director of the clothing department of the Royal Army (1916-17) and air minister (1917-18). Rothermere later endowed professorships at Cambridge and Oxford in memory of his sons, killed in World War I. His personal writings included "My Fight to Rearm Britain" (1939).

VISCOUNT ROTHERMERE

British Official Photo

Rothschild (*rŏths′chīld*), the name of an eminent family of bankers, so named from *Zum Rothen Schilde,* meaning At the Red Shield, the sign of the house in which their ancestors lived in Frankfort, Germany. Mayer Anselm, the founder of this great financial house, was born in Frankfort-on-the-Main in 1743 and died in 1812. He was a German of Jewish extraction and was the first to assume the name of Rothschild. After receiving an education for the position of a rabbi, he won the confidence of the landgrave of Hesse, who entrusted him with the care of $5,000,000 during the French invasion of 1806. He was allowed the free use of this vast sum and, by putting it out at interest, not only prevented the French from securing it, but was enabled to lay the foundation for the great wealth now possessed by his posterity. Afterward he associated his sons with him in the banking business, and the family has since been connected closely with the financial affairs of Europe. His five sons were the financial kings of Europe at the time of his death, and they and their sons continued to gain in wealth and influence in the 19th century. *Anselm Mayer von Rothschild* (1773-1855) became the head of the Frankfort bank. The others were established at different financial centers as follows: *Solomon Mayer* (1774-1855), at Vienna; *Nathan Mayer* (1777-1836), at London; *Karl Mayer* (1788-1855), at Naples; and *Jacob Mayer* (1792-1868), at Paris.



Courtesy The Bettmann Archive, N.Y.

ARMS OF THE ROTHSCHILD FAMILY

Frankfort was the common center of the Rothschild system of banks, and no business of magnitude was transacted without communicating with headquarters. The business consisted mainly of making loans on a large scale, such as those negotiated by governments, railroad companies, and corporations looking forward to the building of canals and other great enterprises. However, the company also did a general banking business. A splendid example of their ingenuity is seen in their employment of swift-sailing boats, carrier pigeons, and other early means of rapid communications for the purpose of ascertaining the fortunes of battles in the time of great conflicts, thus enabling them to turn their speculative enterprises to good account. An enterprise of this kind conducted by Nathan Mayer in connection with the Battle of Waterloo gave the banking house information of the great contest several hours before it reached England, and from this fact the institution gained about $1,000,000. Austria created the five brothers barons in 1822, and several members of the family have been similarly honored in Germany and England. *Lionel Nathan* (1808-79) was the first Jewish member of Parliament (1858) and his son, *Baron Nathaniel von Rothschild* (1840-1915) was made a peer in England in 1885. A large number of hospitals and educational institutions have been endowed by different members of the family.

Courtesy Lijnbaan Assn.; Netherlands Information Service

VIEWS OF ROTTERDAM

Lijnbaan Plaza (*left*), a postwar shopping center, and Meuse Harbor (*right*), with Rhine Harbor in the background

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Rotogravure (*rō-tō-grȧ-vūr′*), a photomechanical intaglio process of printing, by which imprints are obtained rapidly, in large quantities, fully reproducing the detail and quality of tone of the original; hence, a print made by the process. An intaglio, or engraving, of the illustration to be reproduced is etched into a cylindrical copper plate which is attached to the rollers of a rotary printing press. Pictures and text are printed by rotogravure, in monotone or colors. First developed for the multiple reproduction of works of art, rotogravure is now widely used in newspaper supplements, magazines, catalogues, wallpaper, textiles, etc.

The process was invented by Karl Klietsch, a Bohemian artist and photographer, in 1875, while he was employed as a calico printer in Lancaster, England. He had been trained at the Acad. of Painting in Prague, later conducting a photograph studio in Brünn, where his first experiments had been made. After discovering the principle of photogravure he continued working at the Lancaster printing plant and, in collaboration with a fellow-employee, perfected the rotogravure process, but kept it secret for some years. Prints made by the new method, originally known as the "Rembrandt" process, were first produced and sold in 1895. The process was introduced in the U.S. about 1912. See also *Printing*.

Rotor (*rō′tẽr*), a revolving member of a machine on which work is done or which does work. It may also be a rotating member for converting energy, as in a turbine (*q.v.*) or in an electric machine. In an electric motor or generator (*q.v.*), the rotor is known as an armature. Rotors also play a part in turbines (hydraulic, steam, or gas), in blowers or rotary pumps, and in aircraft engines of various types (see also *Aviation; Turbo-Compressor*).

Rotten Boroughs (*rŏt′'n bûr′ōz*). See *Great Britain:* HISTORY.

Rotterdam (*rŏt′ẽr-dăm*), the second city of The Netherlands, lying on both banks of the River Maas. It is about 20 m. from the North Sea, with which it is connected by the New Waterway. Its connections with the North Sea, with Central Europe through the Rhine, and with Belgium and France through the Meuse and numerous waterways make it one of the greatest port cities of the world. Rotterdam's major industries are closely related to the port and include shipbuilding and ship repair, metal and machinery production, and oil refining. In addition, the city manufactures such products as foods and beverages, tobacco, chemicals, clothing and textiles, and furniture.

The Boompjes (small trees) Quay, so named for a row of small linden trees planted in 1615, is among the old loading docks. The residential and business districts of Rotterdam are mainly on the north side of the river, while most of the docks and wharves are on the south side. Before the war, the houses were built along tree-bordered canals that ran through the center of the city, but most of the canals have since been filled in in accordance with reconstruction blueprints. Many of the city's buildings have been erected on pile foundations.

In the 16th century, the Church of St. Lawrence (the Grote Kerk) was completed. This church, which was severely damaged during World War II, has a celebrated organ, with nearly 5,000 pipes, and beneath it are the tombs of many naval heroes. The Boymans Museum has a well-known collection of pictures, drawings, and prints, and the Prins Hendrick Nautical Museum displays ship models, globes, atlases, etc., some dating back to the 15th century. The schools and scientific institutions of Rotterdam include the Netherlands School of Economics, founded in 1913. One of the world's noted zoos is the Blijdorp, or Royal Rotterdam, Zoo. The

16th-century humanist Erasmus, born in the city, is commemorated by a statue of 1622 and a 1954 mosaic—on the façade of Holbein House—which is based in part on his portrait by Holbein; the municipal library has a collection of historical documents relating to Erasmus' life. The rebuilding of Rotterdam has spurred the erection of new sculpture, notably the "Monument for a Devastated City" (1953), by Ossip Zadkine.

A fishing village on the Rotte River in 1283, Rotterdam obtained full city rights in 1328. In 1572, early in the Dutch war of independence against Spain and after the Spaniards had organized a bloody massacre, the town declared itself for William the Silent of Orange. This proved commercially advantageous, because the great harbor city of Amsterdam, still on the Spanish side, was almost boycotted. Rotterdam gained further significance as a world harbor when the New Waterway was dug (1866-72) to Hook of Holland (ferry point to England, 18 m. W. of Rotterdam), making the city accessible to the largest ocean vessels.

During the German invasion of Holland, the bombing of Rotterdam, on May 14, 1940, which destroyed the entire heart of the city, was the turning point of Dutch resistance, as the invaders, by threatening to destroy other cities, enforced capitulation. The Germans also wrecked the harbor before withdrawing in 1944. The city has since made a remarkable postwar recovery, and modern, functional city-planning and architectural-reconstruction programs are progressing. Population, 1957, 726,060.

Rotunda (*rō-tŭn'dạ*), in architecture, a term used to designate a round structure covered by a cupola or dome. The classical example is the Pantheon in Rome, originally built in 27 B.C. Among the many later examples of this type of building, the Pantheon in Paris (1764) is most noteworthy.

Rouault (*rōō-ō'*), GEORGES, painter, born in Paris, France, May 27, 1891; died there, Feb. 13, 1958. Rouault, a leading representative of expressionism (*q.v.*), was one of the group known as the *Fauves* (*i.e.*, wild beasts), who, as they demonstrated at the Paris Autumn Salon (1905), strove for a highly subjective, often violent, emotionalism, in reaction to the objective and unemotional tendencies of the neoimpressionists. Rouault was inspired by the decorative and technical effects of medieval art, especially by the colors and framed contours of stained-glass windows. Like other expressionists, he tended to emphasize pathos and to exaggerate forms. He painted—in his glowing, though somber, colors, framed by strong, black lines—judges and clowns, a Biblical king and Christ, expressing sorrow and evil throughout. His works include the "Clown" (1907), "Three Judges" (1913), and "Christ Mocked by Soldiers" (1932), one of his best-known paintings.

Roubaix (*rōō'bä'*), a city in France, in the department of Nord, 6 m. E. of Lille. It is connected by rail with all parts of France and by the Roubaix Canal with the Scheldt River in Belgium. Destroyed by fire in the 17th century, it did not become a modern industrial city until the 19th century, because of the opposition of Lille, of which it was a dependency. With Tourcoing, about 1 m. away, it now forms an important commercial center, specializing in the manufacture and sale of textiles, particularly woolens. Population, 1954, 110,000.

Rouen (*rōō-äṉ'*), a city in France, capital of the department of Seine-Inférieure, 70 m. N.W. of Paris, on the Seine River. Because of its extensive rail and marine facilities, Rouen developed into an industrial and commercial center, producing such diversified commodities as textiles, chemicals, soap, machinery, plaster and sand, and spirits. The city, heavily damaged during World War II, nevertheless preserved many of its medieval and Renaissance architectural and art treasures. Outstanding are the cathedral, a work of the 13th and succeeding centuries; the Church of St. Maclou, with its famous carved wooden doors; the Abbey Church of St. Ouen; the Great Clock and its Belfry, a Renaissance pavilion with a clock from 1447; and the Palais de Justice, one of the masterpieces of Gothic and Renaissance architecture. The Ceramics Museum provides an excellent survey of the local product, from 1540 through the decline of china manufacturing in 1800.

Rouen was founded in the early Celtic period and later was held by the Romans. The Normans conquered it in 841, and it became the capital of Normandy in 912. Between 1066 and 1204 and between 1419 and 1449, it was held by the English. In 1431 Joan of Arc was burned here; the exact site of the pyre is still marked on the sidewalk of the Place du Vieux-Marché. Rouen was occupied by the German army in World War II. Population, 1954, 116,000.

See also *Chinaware*.

Rouge (*rōōzh*), a cosmetic in various tones of red. It is composed of coloring matter of natural or synthetic origin (such as a nontoxic coal-tar dye) which has a supporting base of talcum, precipitated chalk, or zinc stearate, with or without small amounts of oil. Rouge is frequently compressed into small cakes, or compacts. Liquid rouge is a powder suspended in a colloidal water gel of zinc hydroxide or magnesium hydroxide.

Jeweler's rouge is iron oxide which is used for polishing metals. The color of jeweler's rouge may range from red to black, and the size of its particles from coarse to very fine, according to the use for which it is intended.

Rouge-et-Noir (*ro͞ozh-â-nwär′*), the name of a game played with cards. It is so called because it is played upon a table marked with two spots of red and black, the name meaning red and black. *"Le Rouge et le Noir"* is also the title of a work by Stendhal (*q.v.*).

Roughriders (*rŭf-rīd′ẽrz*), THE, the name of the First U.S. Cavalry Volunteers, organized by Theodore Roosevelt and Leonard Wood (*qq.v.*) for service in the Spanish-American War (*q.v.*). The men induced to join the regiment were mostly the zestful cowboys and sheriffs of the Southwest, who lent color to the dashing exploits of the organization in battle. The men underwent training in Texas in the spring of 1898, but their horses were abandoned before about half their number embarked for Cuba. The Roughriders took part in several engagements, notably at San Juan Hill on July 1, 1898.

Roulette (*ro͞o-lĕt′*), a game of chance played with a small ivory ball on a table. A revolving disk is located in the center of the table, the sides of which are divided into 38 compartments painted half red and half black. The compartments are numbered from 1 to 36, besides a zero and a double zero. Players place their wager upon one of the compartments, and, if the ball falls into the compartment of their choice, they receive 36 times their stake. A player may bet on two or more numbers, depending upon the rules of the game.

Rounders (*round′ẽrz*), a game of ball played extensively in England as an outdoor exercise. Each side has nine players, who alternate as the *in* and the *out* sides. The ground is platted into a square, which has three goals and a batter's station. It is the aim of the batter to drive the ball as far into the field as possible and run completely round the goals, or make as many goals as possible. The batter has three strikes, but must run the third time whether he hits the ball or not, and is declared out if the ball is caught in the air by one of the fielders, or if he is touched by the ball before he reaches a goal. When three men are out, the side playing must take the field, while those in the field take the bat. This game is the origin of the more highly developed American game of baseball.

Roundheads (*round′hĕdz*), the name given as a mark of derision to the Puritans, or supporters of Parliament, during the Civil War in England, from their fashion of wearing the hair short. The Cavaliers, or adherents of Charles I, wore their hair in long ringlets.

Round Table (*round tā′b′l*), the name given to the knights associated with Arthur (*q.v.*), king of the ancient Britons. The name derives from the round table at which they took their seats in his legendary palace, Camelot (*q.v.*).

Rourke (*ro͞ork*), CONSTANCE MAYFIELD, author, born in Cleveland, Ohio, Nov. 14, 1885; died in Grand Rapids, Mich., March 23, 1941. She was educated at Vassar Coll. and later studied at the Sorbonne. She taught English at Vassar, 1910-15, and showed her interest in the colorful past of American history with an article on Paul Bunyan (*q.v.*), published in 1918. Her books include "American Humor" (1931), "Davy Crockett" (1934), and "Charles Sheeler" (1938).

Rousseau (*ro͞o-sō′*), HENRI JULIEN FÉLIX, painter, born May 20, 1844, in Laval, France; died Sept. 4, 1910, in Paris, France. It is probable, but by no means certain, that he went to Mexico in 1862 with Emperor Maximilian's army as a musician in a military band. In any case, he was in France in 1866, when he was demobilized from the army and became a lawyer's clerk. He served in the Franco-Prussian War and was later employed for some years in a toll or customs station near Paris, for which reason he is known as *le douanier* (*douane* = toll). In 1885, he retired on a pension, having decided to devote the rest of his life to painting. He had never had any instruction and there is no painting of his extant which is dated before 1880. He was, however, quick to develop his own style and to win at least a certain acceptance with the more advanced of his contemporaries. As early as 1886 his "Carnival Evening" was exhibited in the Salon

THE WEDDING. PAINTING BY HENRI ROUSSEAU

Courtesy French Press & Information Service, N. Y.

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of the Independents, which had been founded two years earlier by a number of young French painters whose work was too radical for the judges of the regular salon. Not before 1891 did Rousseau begin to paint the jungle scenes for which he later became famous. It was at first believed that the strange, exotic animals and plants which he painted so often were drawn from memories of his years in Mexico, but it was later discovered that they were actually the result of visits to the Paris zoo and botanical gardens. Rousseau sold almost none of his paintings during his lifetime and was ridiculed by both critics and the public, but in the last years of his life his work came to be greatly admired. His first one-man show in the U.S. took place in the year of his death.

Although Rousseau is generally considered to be a naive, "primitive" painter, his work is by no means as artless as it appears on first glance. He had a sure sense of form and color which he used with great skill within the framework of the simple patterns of a folk painter.

Rousseau, JEAN BAPTISTE, poet, born in Paris, France, Apr. 6, 1671; died in Brussels, Belgium, Mar. 17, 1741. After attending several educational institutions in Paris, he began to write comedies for the theater. Among them were "Le Café" (1694), "Le Flatteur" (1696), "Le Capricieux" (1697), also an opera, "Venus et Adonis." As these were not particularly successful, he turned to writing odes and epigrams and achieved considerable renown for his satirical pieces. His lyric verse was admired by his contemporaries, particularly the critic Boileau. He became a member of the Académie des Inscriptions in 1701, and, in 1710, presented himself as a candidate for the Académie Française. Two years later he was thrown out of the Café Laurent, a gathering place for artists and writers, because of some libelous verse attributed to him. He accused Saurin of circulating these epigrams under his, Rousseau's, name, but as this could not be proved, Rousseau was tried in court and condemned to perpetual exile. Although invited to return in 1716, he preferred to remain abroad. He lived for a time in Switzerland and then went to Brussels, where he met and had some literary skirmishes with Voltaire. Rousseau's complete works were published in five volumes in 1820. The best edition of his work was prepared by Antoine de Latour, "Oeuvres de J.B. Rousseau" (Paris, 1869).

Rousseau (*rōō-sō'*), JEAN JACQUES, French philosopher and author, born in Geneva, Switzerland, June 28, 1712; died in Paris, France, July 2, 1778. He was descended from a French family that had settled in Geneva a century before his birth as Protestant refugees. His father, Isaac Rousseau, was a watchmaker. His mother died in childbirth, but he was tenderly cared for in infancy by his father's sister. When he was 10, his father was forced to flee Geneva as the result of a brawl and the young Rousseau was placed under the care of a Protestant minister at Boissy, where he remained for two years. In 1725, he was apprenticed to an engraver in Geneva. As a youth Rousseau was studious, but he soon formed undesirable habits for want of a fixed home, especially while under the care of the Geneva engraver, a violent and harsh man.

In 1728 the impulsive youth fled from the real or fancied severity of his employer and found a home with Madame de Warens, who resided at Annecy. She sent him to a charity school in Turin. While at this institution he embraced Catholicism, and afterward again made his home with Mme. de Warens. The story of the next few years of his life is a confused one, in which Rousseau alternately set off from the home of Mme. de Warens to try his hand at some new occupation and then returned to her. Finally, in 1741, he left to seek his fortune in Paris, where, for a time, he earned his livelihood as a clerk and in copying music. In 1743, he was made secretary to the French ambassador at Venice. Two years later he resigned and returned to Paris to engage as a musical copyist and to become a student of sciences. After forming the acquaintance of Grimm, Vasseur, Diderot, and D'Holbach, he began to write for Diderot's "Encyclopédie." The account of his life to this point has little authority except his own autobiographical "Confessions" and must, in many particulars, be taken with a grain of salt.

At about this time he took as a mistress an uneducated servant girl, by whom he had several children. He himself says, although perhaps not altogether reliably, that they were all placed in public institutions, in sharp contradiction to the views on the upbringing of children which he later outlined in "Émile."

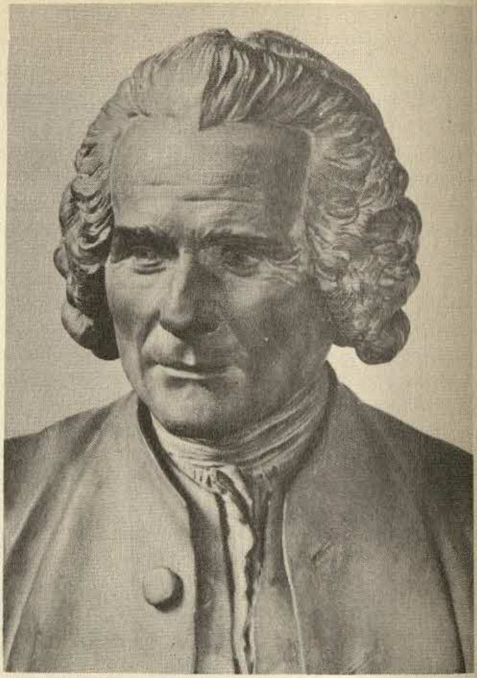
About 1750, he won a prize offered by the Acad. of Dijon for the best essay on the question "Has civilization tended to improve morals?" In it he took his famous position that civilization has not only failed to purify manners, but has been the cause of much of the misery afflicting mankind. His next writing consisted of an operetta, in 1752, to which he wrote the music. Soon after he issued a publication called "Letters on French Music." He returned to Geneva in 1754 and again embraced Protestantism, but went back to Paris in 1756 to devote the remainder of his life almost exclusively to literary work. Almost at once, he quarreled with Diderot and Voltaire, a quarrel which was never mended and which lost for him the support of many of the contemporary intellectuals.

By 1762, he had written his three principal works, "Julia, or the New Héloïse" (1760), "The Social Contract" (1762), and "Emile" (1762), and these works had made him so unpopular with the authorities that he was forced, or at least thought he was forced, to flee to Neufchâtel to avoid arrest. When that haven, too, became dangerous, he went to Berne, and thence, in 1766, to England, where he formed friendships with Hume and Boswell. There he began the writing of his "Confessions." In 1767, having alienated Hume, he returned to France and supported himself by writing and copying music, but he lived in great poverty until his death.

The mere narration of Rousseau's life, with its frequent and abrupt changes in circumstance, make it clear that many of his ideas can be explained simply in terms of his resentments, even though his difficulties were most often of his own making. At least it may be said that his personal fate made him especially susceptible to the revolutionary ideas which moved his century. That he succeded so well in influencing his times must be ascribed to those qualities which represent his greatest merits: his sincere closeness to nature and his feeling for it; his intrinsically religious temperament, although he himself would not have admitted it; the admirable, persuasive lucidity of his style, which made his books understandable to a large reading public; and, finally, the fact that it was his good fortune to articulate at the crucial time the ideas which his thinking contemporaries had already espoused and which were destined to spread to all classes. Thus, he is not one of the pioneer thinkers of his period, but rather the successful formulator and popularizer of already widespread ideas. It was to his advantage that he was, although less profound, also less abstract an intellectual than the contemporary philosophers D'Alembert, Diderot, and Voltaire, with whom he was connected by common ideas.

The leading idea of Rousseau's work is to unveil the cynicism and frivolity under the shining and tasteful surface of the leading strata of society. It is his hypothesis that, as civilization progresses, moral values recede, and that education and, even more, philosophy, tended to suffocate the voice of simple reason and the actions and reactions of human nature.

"Émile" takes up one phase of his solution for this problem. In order to eliminate the influence of society, he believed that children should grow up in isolation. Then the natural kernel of goodness and wisdom common to all humans would develop and the child would be able to acquire knowledge, to understand art, and finally even to find his God. This book—especially its simple definition of religion and of the relationship of man to God without the mediation of a church—had a tremendous influence on his contemporaries. Everyone felt that these ideas, only vaguely understood before, had now been clearly formulated. This influence was not confined to the general public; the leading spirits of the time agreed heartily and the greatest educator of the century, Pestalozzi (*q.v.*), tried to realize Rousseau's idea in practice.



Courtesy Metropolitan Museum of Art, N. Y.

JEAN JACQUES ROUSSEAU

Bust by Jean Antoine Houdon (1741-1828)

As "Émile" deals with the innermost problems of education, so "The Social Contract" tries to solve social problems. Again Rousseau praises the "natural" state of mankind, a tribal society. He believed that it was the concept of individual property which had developed social differences, with their concomitant economic implications. Government, he felt, is nothing more than the organization of a mutual insurance of property. Out of the functions of government, which are connected with the protection of property, despotism has developed, and, therefore, according to Rousseau, revolution against existing government is morally motivated and morally sanctioned. In contrast to this kind of government, he developed his own idea of Utopian society. The common will, the consent of the governed, should be, he believed, the supreme law. Society must be superior to the individual, but within this order the individual himself must be free. Paradoxically, this idea of individual freedom advocates the most brutal punishment of heretics against this order of society. The history of the French Revolution, for which this "Social Contract" became almost a canonical textbook, and some recent dictatorships, show where this intolerance in the name of a new freedom leads: toward tyranny which is worse than the one which it was supposed to fight.

In some paragraphs of "The New Héloïse," Rousseau's individual faith and piety emerge clearly, despite his skepticism. His systematic views on religion, however, were outlined more specifically both in "Émile" and in "The Social Contract." He always pleaded for religious freedom, distinguishing between individual religion (what he called *religion naturelle*) and secular religion (*religion civile*), the control of the latter being a task of government. While he is liberal as to the tenets of personal religion, he develops a strict minimum of creeds for secular religion. These creeds, which must be protected by the state, include belief in one God, belief in a life after death with its rewards and punishments, and belief in the inviolability of the laws.

Rousseau's admirable style is most clearly expressed, perhaps, in his "Confessions" and its continuation, "Reveries of a Solitary Stroller." Other works from his pen include "Discourse on Arts and Sciences," "Letters From the Mountain," "Rousseau's Dream," and numerous criticisms and musical productions.

Rousseau, LOVELL HARRISON, lawyer and soldier, born in Lincoln County, Kentucky, Aug. 4, 1818; died Jan. 7, 1869. He studied law, was admitted to the bar, was a member of the Indiana legislature from 1844-45, and became a member of the state senate in 1847. He organized a company of Indiana troops for the Mexican War, serving under Gen. Taylor in the Battle of Buena Vista and others. After the war he established a law practice in Louisville, Ky., and became a member of the state senate. In 1861 he entered the Union Army, and as brigadier general commanded at the battles of Shiloh and Perryville in 1862. He was made major general of volunteers, and served at Stone River, Chattanooga, and Chickamauga. In 1865 he became a member of Congress from Kentucky, and in 1867 was brevetted major general and sent to Alaska to assume control of the territory purchased in that year from Russia. He was assigned to the department of Louisiana in 1868.

Rousseau, PIERRE ÉTIENNE THÉODORE, landscape painter, born in Paris, France, Apr. 15, 1812; died Dec. 22, 1867. He was the son of a tailor and studied in the École des Beaux Arts. Later he traveled extensively to study landscape and sky effects, and in 1834 made his first exhibit at the Salon, where he received gold medals in 1849 and 1854. He was decorated with the cross of the Legion of Honor in 1852. His works are noted for their faithfulness to nature. His landscapes include "Early Summer Morning" and "Alley of Chestnut Trees."

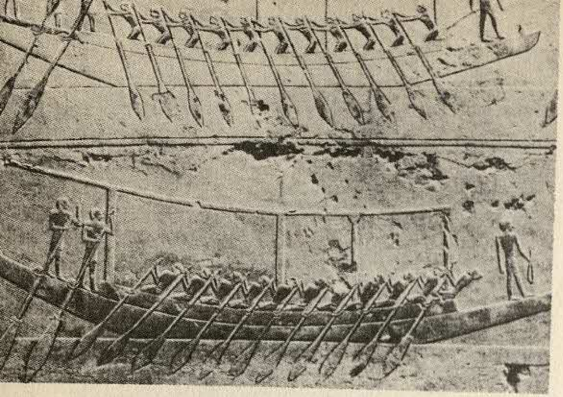
Rowan (*rō'ạn*), STEPHEN CLEGG, naval officer, born near Dublin, Ireland, Dec. 25, 1808; died in Washington, D.C., Mar. 31, 1890. He came to the U.S. at an early age, studied at Oxford Coll., O., and entered the U.S. Navy as midshipman in 1826. After entering the military service, he assisted in the capture of Monterey and San Diego, in 1846, in the Mexican War, and in 1855 became commander. He served on the Potomac in 1861, and the following year commanded the fleet on Roanoke Island, being made captain for capturing Ft. Macon. From 1862-64 he commanded the *New Ironsides* off Charleston. He received a vote of thanks from Congress and was promoted to rear admiral in 1866. He was made commander of the naval station at New York (1872), president of the board of examiners (1879), and superintendent of the naval observatory (1882).

Rowan Tree. See *Mountain Ash.*

Rowing (*rō'ĭng*), the art of propelling a boat or vessel by means of oars. The term *rowing* applies properly to the method of propelling a vessel by a number of men, each of whom handles an oar and is known as an *oarsman*, while the act of handling an oar by each hand is called *sculling*, and such oars are properly *sculls*. Rowing by means of oars was formerly an important enterprise and anciently much freighting was done by this means, but civilized nations have displaced it almost exclusively by the application of electric, gasoline, and steam power. Sculling is now carried on extensively in competitive races. Single sculling is most common, but in some instances a number of scullers work in unison, usually in pairs, fours, sixes, or eights.

Rowing is an ancient pastime and economic enterprise, but it did not become prominent as a sport until about the middle of the 19th century. Crews for rowing were organized at the leading colleges of Europe as early as 1820, and boats carrying from two to eight rowers soon came into use. Races have been held annually by Cambridge and Oxford since 1856. The course employed chiefly by these institutions is on the Thames, from Putney bridge to Mortlake church, or the reverse, a distance of 4½ m. Regattas are maintained with great success in Germany, Holland, Denmark, and Sweden, and the contests are both national and international.

Rowing associations are maintained both in Canada and the U.S., and these countries have had competitive tests with various associations of England, both at Henley and on the Thames. In 1873 was founded the National Assn. of Amateur Oarsmen, which is one of the leading American organizations, but there are many others,



ROW BOATS USED ON THE RIVER NILE

Egypt, *ca.* 2500 B.C.

including the regattas on the Schuylkill River in Pennsylvania, the Hudson River in New York, and the course at New London, Conn.

Rowland (*rō'land*), HENRY AUGUSTUS, physicist, born at Honesdale, Pa., Nov. 27, 1848; died Apr. 16, 1901. In 1870 he was graduated from the Rensselaer Polytechnic Institute at Troy, N.Y., having taken a course in civil engineering. He became an instructor at Wooster Coll., O., and later assistant professor at Rensselaer Polytechnic Institute. In 1875 he was made professor of physics in Johns Hopkins Univ., serving until the time of his death. To equip himself for this important position, he made an extended tour of Europe for the purpose of conducting scientific research, purchasing apparatus, and studying methods of instruction. His publications in his field of science were numerous.

Rowlandson (*rō'land-sŭn*), THOMAS, painter, illustrator, caricaturist, born in London in 1756; died there in 1827. After studies at the Royal Acad., he went to Paris and traveled on the Continent. His drawing of Vauxhall Gardens (1784), exhibited at the Academy, was so successful that the print made after it helped spread his fame. In 1809-11, his series, "The Schoolmaster's Tour," was published in a periodical and many other series (in collaboration with author and publisher) followed. His main success lies in his vivid depictions of the English life of his time, with all its daily happenings; he not only illustrated but also caricatured them.

Roxana (*rŏks-ăn'ȧ*), daughter of Oxyartes, king of the ancient country of Bactria (Balkh), once a part of the Persian Empire until conquered by Alexander the Great, who married Roxana. After Alexander's death Roxana was imprisoned and murdered (*ca.* 311 B.C.).

Roxas y Acuña (*rō'häs ē ä-kōō'nyȧ*), MANUEL, President of the Philippines, born at Capiz, P.I., 1892; died 1948. He was admitted to the bar in 1913 and for 12 years served as secretary to the chief justice of the supreme court of the Philippine Islands, continuing in this post during his first term as representative (1922-25). He served as speaker of the house until 1932 when he became secretary of finance. When World

Courtesy British Information Services, N. Y.

VAUXHALL GARDENS. PAINTING BY THOMAS ROWLANDSON

War II broke out, he served as liaison officer between U.S. headquarters and the Filipinos, until he surrendered to the Japanese. After his release from the invaders, he returned to Manila, where he helped draft the constitution of the Japanese puppet government. When the puppet government was captured by the Americans, Roxas was released by Gen. MacArthur, and, returning to politics, was elected to the senate and became its first president. In April 1946, Roxas, as the candidate of the liberal wing of the Nationalist party, was elected President of the Philippines, defeating the incumbent Sergio Osmena, the candidate of the conservative wing of the same party, in the first contested Presidential election in Philippine history.

Roxburghshire (*rŏks′bûrg-shēr*) or ROXBURGH, a border county of Scotland, bounded on the N. by Berwickshire, on the E. and S.E. by Northumberland, on the S. by Cumberland, on the S.W. by Dumfriesshire, and on the N.W. by Selkirkshire and Midlothian. The area is *ca.* 665 sq. m., and the capital is Jedburgh. The Teviot River traverses the county, joining the Tweed near Kelso, in the northeast. The Cheviot Hills lie along the border with England. In a fertile farming and sheep-raising district, the county manufactures tweed cloth and woolen goods. Relics of Pictish and Roman invaders are still extant in the area. It was ceded to Scotland by the Britons in 1018 but was the scene of border warfare for centuries. Population, 1951, 45,562.

Royal Academy of Arts (*roi′ạl ȧ-kăd′ẹ-mȳ of ärts*), in London, England, founded in 1768. This British society is one of the oldest institutions in the world for the furthering of the figurative arts (painting, sculpture, and architecture). The great English painter, Sir Joshua Reynolds (*q.v.*), was its first president.

Royal Canadian Mounted Police (*roi′ạl kăn-ā′dĭ-ạn moun′tẹd pō-lēs′*), an organization charged with both police and administrative duties throughout Canada. Established in 1873 as the Northwest Mounted Police, it had jurisdiction only over the Canadian Far West. As it was merged with other forces, the name was changed in 1904 to Royal Northwest Mounted Police; the current name was adopted in 1920 when it was combined with the Dominion Police and its jurisdiction was expanded to include all of Canada. Among its functions are control of narcotics traffic and smuggling and enforcement of the Excise Act. In 1959 the force comprised more than 6,300 men; headquarters are in Ottawa, Ont.

Royal Gorge (*roi′ạl gôrj*), a celebrated canyon in Fremont County, Col., through which flows the Arkansas River. In many places it is skirted by bluffs that rise fully 3,000 ft. above the river, which pursues a rapid and tortuous course. The rocks are variously colored and formed, giving the region a most picturesque and imposing aspect.

Royal Institution of Great Britain (*roi′ạl ĭn-stĭ-tū′shŭn*), an organization established in London, England, in 1799. It was chartered the following year under the name of the Royal Institution for the Promotion, Diffusion, and Extension of Science and Useful Knowledge. Scientific and literary research, promotion of the experimental sciences, application of new discoveries to the arts, and provision of opportunity for study are its principal objectives. It has a library of more than 60,000 volumes and a noteworthy collection of scientific instruments. Many bequests have been made to it. The election of new members is by ballot. Benjamin Thompson, Count Rumford, originated the idea of such an institution, and it was largely through his efforts, as well as those of Sir Humphry Davy and Michael Faraday, that the institution flourished from the very first. Among the lecturers have been Sir Humphry Davy, John Tyndall, Lord Kelvin, Sir Thomas Bragg, Michael Faraday, Thomas Young, Thomas H. Huxley, and many other men prominent in science.

Royall (*roi′ạl*), KENNETH CLAIBORNE, U.S. Secretary of the Army, born in Goldsboro, N.C., July 24, 1894. After being graduated from Harvard Univ. Law School in 1917, he was admitted to the North Carolina bar in 1919. He embarked upon a highly successful practice. He served as a State Senator in 1927 and as a presidential elector in 1940. A veteran of World War I, he also served in World War II, entering the Army as a colonel in 1942. He became chief of the Army Service Forces legal section, then was appointed by President F.D. Roosevelt to serve as counsel for eight Nazi saboteurs who had been deposited on American shores by submarine in 1942. Later, he became Deputy Fiscal Director of the Army Service Forces, and was made a brigadier general in 1943. Royall was appointed Under-Secretary of War in 1945. He became the first Secretary of the Army after enactment of the National Security Act of 1947.

Royal Society (*roi′ạl sō-sī′ẹ-tȳ*), THE, an association for the advancement of the mathematical and physical sciences, whose charter name is the Royal Society of London for Improving Natural Knowledge. It is the oldest scientific society in England, founded in 1660, and thus is one of the oldest in Europe. The Society has, on numerous occasions, performed services for the British government. A number of scientific expeditions, as well as much research, have been undertaken. Weekly meetings of the members, who are called fellows, are held from November to June for the purpose of discussions, which are preceded by the reading of papers on scientific subjects. The *Philosophical Transactions,* founded in 1665, is an annual in which the more important papers and proceedings are published, and the *Proceedings,* first issued in 1880, is a periodical devoted to publishing abstracts of papers and accounts of general transactions. In 1956 the membership consisted of 568 British and 60 foreign fellows. New members are elected annually, but new admissions are restricted to 25 British and four foreign fellows each year. The society is supported by parliamentary grants-in-aid, and additional support is secured by private contributions. Since its organization, many eminent scientists of Great Britain have been enrolled, and the membership has always included a number of foreign scholars. Among the presidents have been Sir Robert Moray (the first president), Sir Christopher Wren, Sir Humphry Davy, Samuel Pepys, Sir Isaac Newton, Sir Hans Sloane, James West, Thomas H. Huxley, Lord Lister, and Lord Rutherford.

Royal Society of Canada, a learned organization of the nature of a national academy of letters and science for all Canada. It was founded in 1881 by the marquess of Lorne, governor general of Canada. It has a membership of over 400 fellows. Its main object is to encourage, in various ways, studies and investigations in literature and science. There are five sections, as follows: the French language and literature; the English language and literature; the mathematical, physical, and chemical sciences; the geological sciences; and the biological sciences. The headquarters are at Ottawa. Annual meetings are held late in May at places chosen by the council. The *Transactions* are published annually.

Royce (*rois*), JOSIAH, philosopher and educator, born in Grass Valley, Calif., Nov. 20, 1855; died in Cambridge, Mass., Sept. 14, 1916. He studied at the universities of California, Leipzig, Göttingen, and at Johns Hopkins. He taught English at the Univ. of California (1878-82) and later taught philosophy at Harvard (1882-1916). He was one of the most distinguished idealists of the American philosophers. His works include "The Religious Aspect of Philosophy: Critique of the Bases of Conduct and of Faith" (1885), "The Spirit of Modern Philosophy" (1892), "The Conception of Immortality" (1900), "The Philosophy of Loyalty" (1908), and "Lectures on Modern Idealism" (1919).

Royden (*roi'dẹn*), (AGNES) MAUDE, church leader, born in Birkenhead, England, Nov. 23, 1876; died in London, July 30, 1956. Educated at Cheltenham Ladies' Coll. and at Lady Margaret Hall, Oxford, she began her career as a social worker at the Victoria Women's Settlement, Liverpool, and then in the country parish of Luffenham. In 1908 she joined the woman suffrage movement, serving on the executive committee of the National Union of Women's Suffrage Societies (1908-14) and editing its newspaper, the *Common Cause*. In 1917 she became assistant preacher at the City Temple, London, and three years later was cofounder of the Fellowship Services at Kensington. She was the first woman in Great Britain to serve as pastor in a regular place of worship, the first to be a pastor of the Church of England, although she was never ordained, and the first to be awarded the Doctor of Divinity degree. She wrote numerous books, including "Women and the Sovereign State," "The Hour and the Church," "Political Christianity," "The Church and Woman," "I Believe in God," and "The Problem of Palestine." She was married to the Rev. George W. H. Shaw in 1944.

Ruanda-Urundi (*rōō-än'dä-ōō-rōōn'dē*), a U.N. trust territory (1946-62) in southeastern central Africa, administered by Belgium and bounded on the W. by the (Belgian) Congo, on the N. by Uganda, on the E. and S. by Tanganyika, and on the S.E. by Lake Tanganyika. The area (*ca.* 21,000 sq. m.) now comprises two independent nations—the Republic of Rwanda (capital, Kigali) in the north and the monarchy of Burundi (capital, Usumbura) in the south. The region, which has a healthy climate, consists mostly of plateaus ranging in altitude from 4,500 to 10,000 ft. The indigenous population is composed of three ethnic groups, the Batutsi, Bahutu, and Batwa tribes. Cattle raising and agriculture are the chief occupations. Coffee, tobacco, and pyrethrums are grown; and palm oil is produced. Some gold and tin mining is carried on. Ruanda-Urundi was part of German East Africa, 1899-1917. Belgium acquired it under a League of Nations mandate in 1919. Ruanda and Urundi each had a native ruler, a bami or mwami (sultan), subject to a Belgian administrator with headquarters in the Congo. The two countries became members of the U.N. in 1962. Population, 1959, 4,847,931 Africans; 8,127 Europeans; and 3,859 others.

Rub' al Khali (*rōōb äl ḳä'lē*), the great southern desert of Arabia, stretching from the Aden Protectorate to Oman. It is a low tableland, with an area of *ca.* 300,000 sq. m. The desert was first crossed by Bertram Thomas in 1931.

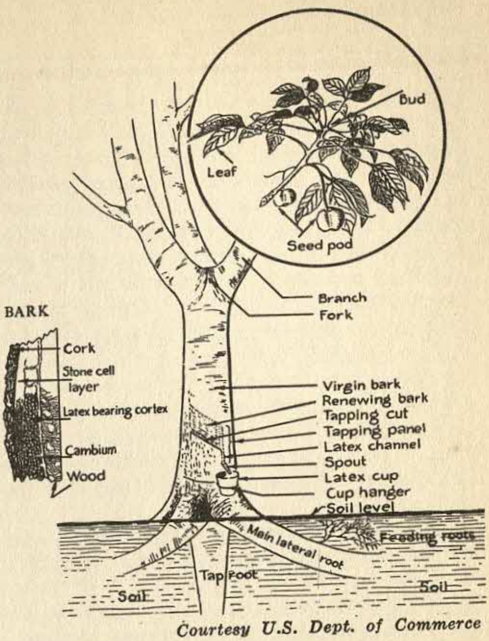
Rubber (*rŭb'ẽr*), CAOUTCHOUC or INDIA RUBBER, a substance made from the coagulated juice or milk (*not* sap), found in the bark of several varieties of trees, shrubs, and plants, and called *latex.* This milky fluid, which seems to be a healing agent manufactured by the plant for repair of injuries, is usually white, sometimes grayish or yellowish. It consists of minute particles of rubber suspended in water which contains small amounts of dissolved salts, soaps, and proteins. Latex, like milk, is an emulsion, and, like milk, will curdle or coagulate on standing.

Alkaline substances such as ammonia added to latex act as preservatives. Latex preserved with ammonia can be shipped long distances and stored for years without coagulating. The specific gravity of latex is about 0.978 to 0.980.

There are various kinds of crude rubber, in part obtained from the following sources: (1) *Hevea Braziliensis,* the rubber of commerce, found in Malaya, Indonesia, Ceylon, Viet Nam, Cambodia, Thailand, Burma, and South and Central America. (2) *Sapium,* from 10 or more species—only two produce good latex, the others being resinous—found in the Amazon basin. (3) *Balata* (*Mimisops*), from 12 or more species, found in tropical South America. (4) *Ceará,* or *Manicoba* (*Manihot*), from several species, found in Ceará, Brazil. (5) *Caucho* (*Castilloa*), from *Ulei, Elastica,* and other species, found from southern Mexico to Brazil. (6) *Bahia Rubber* (*Hancornia*), from *Speciosa,* found in Brazil. (7) *Guayule* (*Parthenium*), from *Argentatum* species, found in Mexico. (8) *Cryptostegia,* from Haiti. *Kok-Sagyz* (Russian dandelion) and American goldenrod are among the shrubs which might be developed as minor sources of latex, along with Guayule (above).

Although small amounts of the rubber imported by the U.S. come from South and Central America, the important rubber-producing regions are Thailand, Malaya, India, Indonesia, Ceylon, Viet Nam, Cambodia, Sarawak, and other areas of southeastern Asia. Of the world area devoted to plantation rubber, 93.7 per cent lies in these regions. Africa accounts for 5.5 per cent, while the rest is in South and Central America and Oceania.

Rubber was a contribution of the New World to civilization. Columbus was the first to introduce samples into Europe. These were in the form of balls which "bounded" and were used by the natives of Haiti for playing games, but the commercial significance of rubber was not recognized until almost 250 years later, when Charles Marie de la Condamine made a report to the Paris Acad. of Sciences (1745). This French world adventurer and traveler had crossed the South American continent from Quito to Pará and had picked up a few oval hunks of something the natives called "cahutchu" (weeping tree)—source of *caoutchouc,* still the French word for rubber. He described how the natives made shoes and other articles by dipping molds or fabrics into the juice of the *Hevea* tree and curing thin layers over smoky fires. But his samples would not melt, and no solvent was known or found for them, though chemists experimented for some years with different solvents; their products proved to be sticky in warm weather, brittle in cold. Other countries took up the challenge. The first patent for waterproof fabrics was issued in England in 1791, and the first rubber factory was probably one established in Vienna in 1811. Meanwhile, the English scientist Joseph Priestley (*q.v.*) had named the new material "rubber" because it could be used to rub out pencil marks.



Courtesy U.S. Dept. of Commerce

RUBBER TREE

Growing wild in the Amazon Valley, the rubber tree is cultivated in the Far East. The average tree is 40 to 50 ft. tall and has dark-green oval leaves about 8 in. long, three in a cluster. It requires a warm, moist climate with 70 to 100 in. of annual rainfall, and grows at altitudes as great as 1,600 ft. The economic life of the tree, as yet unknown, is at least 40 years

Early in the 19th century, interest in rubber became centered in Great Britain and the U.S. In Glasgow, a usable waterproof material was patented in 1823 by Charles Macintosh, whose name became synonymous with raincoats. At about the same time (1820), in London, Thomas Hancock first made elastic bands which could be used for glove wrists, shoe tops, etc. Hancock afterward built the first rubber *masticator,* which made shredded rubber more soluble and permitted the introduction of dry materials to improve it—called *compounding.* As the first English rubber manufacturer, Hancock joined forces with Macintosh to build, in Manchester, a factory which is still in operation.

The first rubber patent in the U.S. was granted in 1813, for a rubber varnish to waterproof shoes, but the first important commercial venture was the Roxbury India Rubber Co., incorporated by a group under the leadership of Edwin M. Chaffee (1833). In his attempts to improve the process of rubber-coating fabric and leather, Chaffee invented a new mixture of rubber, lampblack, and turpentine, and a mixing mill, as well as a type of coating machine (1836) which is still used. Three years later (1839), Charles Goodyear (*q.v.*) discovered the vulcanization process which introduced the great era of rubber manufacturing. With this process, as now used, crude rubber or latex is vulcanized (heated) with sulfur to about 287° F. to increase its strength and usefulness and also to minimize the old troublesome reactions to heat and cold. During the vulcanization, other chemical substances—known as "accelerators," "activating agents," "plasticizing agents," etc.—are added to produce chemical changes in the rubber, which adapt it to products such as tires, footwear and clothing, electric insulation, water and gas hose, shock absorbers, hospital equipment, or any of the other modern items made of rubber.

To understand rubber's importance, it is necessary only to realize that in an ordinary automobile there are, in addition to the tires, more than a hundred parts containing rubber. Rubber is also present in homes and offices. It appears in numerous items from rubber soles and heels to the rubberized fabric in umbrellas; and new uses are constantly being found—such as foam rubber, for mattresses and upholstery, which replaces both springs and padding. In the early days, the chief use for rubber was in footwear and raincoats. Subsequently the automobile became the largest user, but the versatility of rubber is so great that more than 40,000 peacetime products were made of it before the war, and crude rubber was this nation's largest import. The U.S. used each year between 500,000 and 700,000 tons, as against a world use of only some 1,000,000 tons to 1,400,000 tons a year.

Analysis of crude rubber shows it to be a hydrocarbon, made up of isoprene molecules $(C_5H_8)_x$. It is resistant to chemicals and soluble only in carbon disulphide, carbon tetrachloride, and volatile oils such as turpentine, ether, gasoline, etc. The peculiar and special properties of rubber lie in its combination of softness, toughness, elasticity, impermeability, adhesion, and electrical resistance; its most unique quality is that it can be stretched many times its original length and will return almost exactly to its original size; its disadvantages are that it stiffens and cracks when exposed to sunlight and swells up in contact with oil and gasoline.

The gathering of rubber from trees such as the *Hevea Braziliensis* is much the same on all plantations. In the living bark of the mature tree, which is about ½ in. deep, is cut a narrow strip about ¼ in. deep, some 3 or 4 ft. from the ground, and about ⅓ of the way around the tree, in a line slanting at a 30° angle; this allows the latex to run down into a spout and thence into an earthenware cup hung on the tree. The cut is just deep enough to penetrate to the inner layer of the bark, where the latex is contained in a large number of tiny vertical tubes. These latex-containing tubes are found in all parts of the tree except the wood. Additional cuts, made every other day, are very thin shavings on the lower side of the channel, a process which lowers it about 6 in. each year and is continued until it is down to about 1 ft. from the ground. The other side of the tree is then tapped while new bark grows, which takes about six years.

Trees are tapped in the early morning; an experienced tapper covers from 200 to 500 trees a day. Collecting follows; each tapper collects enough latex to yield about 20 pounds of rubber. The yield per acre varies from 400 pounds of rubber a year to as much as 1,000 pounds. An anticoagulant is placed in the four-gallon collecting cans to prevent coagulation while the latex is being carried—by hand, two-wheeled bullock cart, motor truck, or narrow-gauge railroad—to the plantation factory where the material is processed for shipment.

The trees reach maximum production at around 12 years and are known to produce for 40 years; normally each tree yields from 3 to 6 pounds of rubber a year. This yield is greatly increased by "bud grafting," a process in which a budded branch from a high-yielding rubber tree is grafted into the stem of an ordinary young seedling a few inches above the ground. As soon as the grafted piece has taken hold, the old stem is cut off and the graft becomes the tree—called a "clove."

There are roughly three methods of preparing latex for commercial use: (*1*) Natives separate or coagulate the rubber by drying it over a fire, then build up a lump of rubber (called a "biscuit") on a stick which is turned like a spit. (*2*) The Far Eastern plantations coagulate the rubber chemically by the addition of acid to latex, then dry it in the form either of Pale Crepe rubber or Smoked Sheet rubber. To prepare Pale Crepe, the wet chunk of coagulated rubber is thoroughly washed, by being passed under a water spray, and squeezed between two corrugated rolls which are driven at different speeds. The sheets of washed rubber are then hung in the air to dry. To prepare Smoked Sheets, the coagulated rubber is squeezed between two rolls driven at the same speed and is then rinsed, dried, and cured by smoking. (*3*) The latex is sometimes concentrated and preserved by addition of chemicals for shipping in liquid form to the rubber factories. The Crepe and Smoked Sheet rubber are shipped in burlap bales or plywood cases, the liquid latex in special tanks or steel drums.

The sources of the world's rubber have changed greatly since the middle of the 19th century, when practically all of it came from *Hevea* trees which grew wild in the Amazon Valley and Pará was the world's rubber capital. At that time, the chief sources of revenue of the Far East were the coffee plantations. When these plantations were hit by blight, coffee planters moved to Brazil, which then became the world's largest producer of coffee. In the second half of the 19th century, the Far Eastern plantations, no longer able to grow coffee, instituted a search for a new crop and discovered rubber—for which the demand was to grow yearly, with prices rising from $1.00 a pound in the 1860's to $2.50 a pound in 1910 when wild speculation had resulted from increasing industrial use (automobiles, etc.) and diminished supply due to greedy exploitation of both trees and labor. Crude-rubber production increased from about 8,000 tons in 1910 to more than a million tons in 1940. In the meantime, after World War I, the Far East plantations came into full production, quantities began to exceed demand, and prices slumped to 11¾ cents a pound in 1921-22. After this, various plans were tried, with more or less success, to stabilize rubber prices, which fluctuated between $1.21 a pound in 1925 and 12 cents in 1938 on the eve of World War II. The following table presents a graphic picture of the rubber situation when the Japanese victory at Pearl Harbor, followed by the fall of Singapore, cut us off from 95 per cent of our rubber supply at a moment when we needed rubber more than at any time before in our history. Only huge supplies of rubber could enable us to fight a war which could not be won without rapid movement of men and material. That meant tires by millions, as well as rubber in countless other forms.

World Natural Rubber Production—Long Tons

Year	*Far East*	*Tropical America and other*	*Africa*	*Total*
1910	10,979	62,891	20,143	94,013
1920	305,106	30,486	6,402	341,994
1930	802,082	15,781	3,961	821,914
1940	1,355,310	23,555	17,326	1,396,191
1949	1,405.182	27,318	45,000	1,487,500
1957	1,767,896	33,496	113,000	1,914,392

Before the outbreak of World War II, some attempts had been made by U.S. manufacturers to acquire rubber-producing areas, but in 1922 U.S. interests controlled only 2.8 per cent of the world crude rubber supply. This was all, except a small part in the Philippines, in foreign countries. By 1938 American-controlled plantations comprised about 260,000 acres, situated mostly in the Far East and producing some 40,000 tons (about 8 per cent) of U.S. imports. The U.S. government, in 1940, had initiated a program of cooperative action with 13 Latin-American nations to increase rubber production in those countries.

However, there was no possibility that any new sources of natural rubber could be developed in time to build both the great war machine and the program of colossal industrial plants. There was only one solution to that vital problem—synthetic rubber. The U.S. launched a $700,000,000 synthetic rubber program, with the chemical, petroleum, rubber, and agricultural industries, financed by the government, working in cooperation.

In 1955 the government sold the plants to private industry on terms that returned an actual profit to taxpayers—a transaction unmatched in government disposal of surplus industrial capacity. At the time of the transfer in May 1955, synthetic-rubber producing capacity was put by the Attorney General at 737,200 long tons per year. By the end of 1957, private industry had expanded annual capacity to about 1,700,000 long tons, more than enough to meet America's total new rubber requirements.

Synthetic Rubber: There are several main types and many modifications of each type; but none is a true synthetic in the sense that it is a chemical twin of the natural product. Some of their properties are superior to those of natural rubber, some inferior. In 1946 synthetic rubber made up 73 per cent of the total new rubber consumed. In 1950 the American industry consumed 714,279 long tons of natural rubber and 532,007 long tons of synthetic rubber. Yet in 1939 the entire U.S. consumption of synthetic rubber was 1,700 tons, as against 592,000 tons of natural rubber.

Natural vs. Synthetic Rubber
Per Cent of Total U.S. Consumption

Rubber	*1942*	*1945*	*1948*	*1950*	*1957*
Natural	96	13	59	57	37
Synthetic	4	87	41	43	63

Reports for 1956 indicated the following world production: 1,744,746 long tons in the Far East, 113,000 tons in Africa, and 29,696 tons in Latin America, for a world total of 1,887,442 long tons of natural rubber. In 1956, out of a world total of 1,887,442 long tons, manufacturers in the U.S. consumed 562,088 tons. To meet their total requirements of 1,436,000 long tons, they consumed an additional 874,000 tons of American-made synthetic rubber.

It was in 1826 that the scientist Michael Faraday (*q.v.*), son of an English blacksmith, identified the chemical formula for natural rubber, demonstrating its membership in the hydrocarbon family, which includes such familiar hydrocarbons as gasoline, kerosene, turpentine, lubricating and fuel oils, benzene, and natural gas. Some 40 years later, another Englishman, named Grenville Williams, broke down natural rubber by heat and derived from it a liquid with the same chemical composition as rubber (C_5H_8), which he named isoprene. The next important step was taken in 1879 when G. Bouchardat, a Frenchman, obtained from isoprene a substance which had elasticity and some of the other properties of rubber. He was the first to suggest the conception that rubber is a *polymer*—a substance in which the original molecules have linked together to form giant molecules, end to end like loops in a chain, or in a mass like fishhooks. The properties of the polymer, such as strength or elasticity, flexibility or rigidity, depend on the pattern in which the original molecules, like bricks, are built up to form the complex edifice of the final giant molecule.

Like natural rubber, the synthetic rubbers (or *elastomers*) are polymers and contain carbon and hydrogen atoms arranged in much the same way as the atoms in natural rubber. Unlike natural rubber, some synthetic rubbers also contain other atoms, such as chlorine (*e.g.,* Neoprene) or nitrogen (*e.g.,* Buna-N), which contribute to the special properties of these synthetic rubbers.

The synthetic rubbers are produced by the polymerization, or chemical linking together, of small molecules called *monomers.* These monomers are gases or liquids which can be prepared from acetylene, alcohol, petroleum, or coal tar. Butadene, one of the monomers used in producing GR-S or Buna-N, is a gas. It is now made from petroleum, although at one time quantities were made from alcohol, and it can be made from acetylene. Styrene, the other monomer used in making GR-S, is a liquid. It is made from ethyl benzene, a liquid obtained by combining ethylene (a gas obtained in making gasoline from petroleum) with benzene (a liquid distilled from coal tar). Chloroprene, the monomer used in producing Neoprene, is a liquid prepared from acetylene and hydrochloric acid. Acrylonitrile, one of the monomers used in producing Buna-N. is a liquid and can be made from acetylene or ethylene.

Two general methods are employed commercially to convert the liquid of gaseous monomers to solid synthetic rubbers. In the "emulsion polymerization" method, an emulsion is prepared by stirring a monomer into a soap solution containing a substance such as hydrogen peroxide which is capable of causing thousands of individual molecules of the monomer to link together chemically to form giant polymer molecules. It takes from 8 to 24 hours to link together enough of the monomer molecules to form satisfactory synthetic rubber. At the end of that time, the synthetic rubber is obtained as a latex containing from 60 per cent to 80 per cent water and greatly resembling natural rubber latex. The synthetic latex can be coagulated by salt or acid.

When, instead of a single monomer, a mixture of two unlike monomers is employed, a mixed polymer is obtained, in which different monomer molecules are chemically linked together. Such a mixed polymer is called a *copolymer.* Most synthetic rubbers are copolymers.

During World War II, most emulsion polymerization was carried out at a temperature of about 150° F. It has now been found that a superior rubber can be obtained by making the GR-S at a temperature slightly above the freezing point of water (*i.e.,* 41° F.).

The other method of making synthetic rubber is known as "oil phase polymerization." In this method, a catalyst is added directly to the liquid monomer and the rubber is obtained as a solid product. Most of the commercial processes of this type employ boron trifluoride or similar catalysts at very low temperatures.

The first of many futile attempts to make rubber in a laboratory, from other materials, occurred in 1892 when the Englishman Sir William Tilden made isoprene from turpentine and let it stand in a bottle until there were formed large yellow pieces of a substance which somewhat resembled rubber but were useless. In 1915 the Germans succeeded in making a synthetic rubber which was both expensive and inferior and abandoned it in favor of further research. In 1923 the U.S. Rubber Co. produced a butadiene synthetic rubber latex by emulsion polymerization, which set the pattern for many of the later synthetic rubber developments. From 1925 to 1939 work was largely confined to laboratory research.

The first commercially successful substitute for natural rubber was a chloroprene polymer, first called Duprene and later Neoprene, put on the market in 1932 by E.I. duPont de Nemours & Co., and priced at many times the cost of rubber at that time (3 cents a pound in 1933). In 1935 the buna rubbers, polymers and copolymers of butadiene, were first produced in Germany, and by 1940 U.S. rubber chemists had developed methods for the production of a general-purpose synthetic rubber. Butyl and Thiokol had also been discovered in America, the former still in use today, the latter now superseded. From 1942 to 1945 types and varieties multiplied in the U.S. under the government program, spurred by the pressure of war needs. These types fall roughly into four groups, some of them superior to natural rubber in performance with regard to oil resistance, heat resistance, gas tightness, or aging, which are the chief limitations in the use of natural rubber. Most of the synthetics are harder to process than natural rubber and do not have as much strength or as much "bounce" or resiliency, but these disadvantages are being lessened by means of research.

The relative usefulness of the various kinds and types depends upon numerous properties and upon many differences in compounding and fabricating techniques. No one of the synthetic rubbers is superior to the natural type in all respects, but each possesses its own special advantages.

Neoprene, the first commercial synthetic, a polymer of chloroprene (made from acetylene), does not stiffen and crack with age, even though exposed to sunlight; this makes it useful on planes, boats, and automobiles. Resistant to oil and gasoline, it is useful in engine mounts, linings for fuel hose, dishwashing machinery, and other parts which come in contact with fats and grease. Neoprene in latex form is becoming increasingly important to industry. One of its advantages in rubber thread is that it resists dry cleaning. It is also the best synthetic rubber latex available for dipped goods and other applications where physical properties are important.

N- or *Butadiene-Acrylonitrile types,* the second synthetic group to appear on the market, copolymer of butadiene and acrylonitrile, became known under trade names such as Butaprene, Chemigum, Hycar, and Perbunan. When manufactured in a government plant, this classification is known as *GR-A.* The original designation was *buna,* a word coined in Germany, "bu" being the first syllable of butadiene, and "na" being taken from natrium, the classical name for the sodium originally used as a catalyst in the polymerization of buna rubbers. Harder to handle in some operations than natural rubber, the Buna-N's have the peculiar property of resisting aromatic gasoline, cleaning fluids, and oils. Highly essential during the war as a liner for self-sealing gasoline tanks and fuel hose, they are used now for gas and oil hose, gaskets, and other mechanical goods where strength and resistance to gasoline and oils are essential.

Butyl, developed in America during the war, is a copolymer of isobutylene and isoprene. It is different from the other synthetic rubbers in both chemical and physical properties, requiring a longer curing time and having a very high degree of stretch. Outstanding advantages are its chemical resistance and its low permeability to gases. Impermeable to air, it is superior to natural rubber for tire inner tubes, as it holds air more than three times as long, and is now used for most passenger-car tubes. It is also useful for tank and pipe linings, except those exposed to oil or gasoline, to which it is not resistant.

GR-S (Government Rubber, Styrene type), an American modification of the German Buna-S rubber, is a copolymer produced by the polymerization of approximately three parts of butadiene with one part of styrene. Of all synthetic rubbers, it is most similar to natural rubber in processing and performance characteristics. It can be made into finished products by methods and on the equipment which are standard in the rubber industry, and it was specially designed as a wartime substitute for natural rubber in tires. Many improvements in GR-S have resulted in a product which does a superior job in tires of passenger-car sizes, although it makes necessary the addition of some natural rubber for the larger, heavier tires used on high-speed intercity trucks and buses, which must resist rapidly generated heat.

More than 2,000 types of synthetic rubber have been produced and evaluated since World War II. Many have been found to do a better job than any competing raw material. Their use has greatly improved not only tires but hundreds of other products as well. Scientists in the U.S. discovered a new synthetic in 1957 which duplicates the molecular structure of natural rubber. In periods of emergency, this synthetic (cis-polyesoprene) could free the U.S. from its far-distant sources of supply of natural rubber.

Reclaimed Rubber: An important raw material of the industry, used largely to reduce cost of certain types of rubber products, reclaim also has useful properties on its own. It is generally made from used tire scraps ground to small bits, after which the fabric is removed and the rubber is plasticized by heating with chemicals. It is then washed, dried, blended, and refined by repeated milling. During World War II, the unprecedented demand for reclaimed rubber challenged the industry—with the result that its production and use were increased from approximately 200,000 tons in 1940 to more than 300,000 tons in 1943 (and 1950). Converting to reclaim is not merely a matter of using more reclaim and less new rubber. It involves research, experimenting, and testing, and the development of new formulas, in order to make the change without sacrificing quality. It is often possible to reclaim also the sulfur, carbon black, zinc oxide, or other original materials with which the rubber was compounded, but extensive use of reclaim is profitable only when new rubber is in short supply or high in price. Formula revisions for special uses may involve more expense in normal times than a greater use of new rubber, unless the price of the new shows a real rise.

In 1957 there were 1,493 U.S. establishments (employing 265,000 persons) manufacturing rubber products; sales value of shipments amounted to $6,400,000,000.

Rubens (*ro͞o'bẹnz*), PETER PAUL, greatest Flemish painter of the 17th century, born in Siegen, Germany, June 29, 1577; died in Antwerp, May 30, 1640. He happened to be born in Germany because his father, for being a Calvinist, had been forced to flee from Antwerp. After the family's conversion to Catholicism and the father's death, his mother returned with him to Antwerp (1587). Since his artistic gift showed itself early, he got systematic training in painting while rather young, and by 1598 he had become a master of the guild of painters in Ant-

Courtesy of the Metropolitan Museum of Art, Fletcher Fund, 1944

ATALANTA AND MELEAGER. BY RUBENS
Painting (oil on canvas) executed about 1612

werp, where he produced a number of paintings that attracted wide attention. In 1600 he went to Italy to study and practice his art, spending his time mostly as court painter to the duke of Mantua. He also studied in Venice, Florence, Genoa, and Rome and made a short stay in Madrid, Spain. After active years in his home town, Antwerp (1609-21), during which period he married his first wife, Isabella Brant (died 1626), a second period of traveling ensued (1621-30); he visited Paris and Holland, served as a diplomat in Madrid and London, and was knighted by England's King Charles I in 1630. In 1630, back in the Netherlands, he married his second wife, Helene Fourment, and during the last ten years of his life developed a wide activity in Antwerp.

In his art, Rubens amalgamates all his manifold impressions with his own powerful personality and great gift. His forms are typically baroque, rich and exuberant, as are his brilliant, warm colors. The variety of his topics and fields is surprising: he excels in mythological, historical, and religious paintings (the latter making up about half his total work), as well as in striking portraits of aristocratic personages, the latter of which reflect personalities and Rubens' activities as courtier, artist, and diplomat. His work is represented in almost all museums in the U.S. and abroad. Some of his most famous works (some in more than one version) are "Elevation of the Cross," "Descent from the Cross," "Last Judgment," "Massacre of the Innocents," "Battle of the Amazons," "Judgment of Paris," "Andromeda," "Rape of the Daughters of Leucippus," and the cycle from "The Life of Maria de' Medici." Among his portraits are those of his son Nicolaus, the double portraits of his sons Nicolaus and Albert, of Charles I of England, of Philip IV of Spain, and many portraits of his two wives. Genre paintings and landscapes are not numerous; well known are "The Garden of Love," and "The Kermess," his ideal landscapes with mythological figures, and the great "Landscape with Rainbow."

Rubens employed several assistants in his workshop, and he worked on certain paintings together with other artists. Thus, for some of his very delicate paintings of the Madonna with Child, the framing flower wreaths were done by Jan Breughel the Elder, and in some mythological hunting scenes, the animals were painted by Jan Snyders. Rubens exerted a strong influence not only through his large workshop, for his art was also widely spread by the many copper engravings which were done precisely after his paintings, strictly under the master's supervision. See also *Art.*

Rubicon (*rōō'bĭ-kŭn*), a river of northern Italy, which flows into the Adriatic. It is of interest historically in connection with Caesar who crossed the stream with an army in 49 B.C. The Rubicon was the boundary line that separated his province from the republic of Rome. His act of crossing the stream with an army at the outbreak of civil war between him and Pompey constituted a declaration of war. Writers represent Caesar as hesitating before crossing the stream, and, while passing over, he is said to have uttered the words *"Alea jacta est,"* meaning "The die is cast." "Crossing the Rubicon" has since become a proverb, signifying the undertaking of a hazardous task. It is thought that the Rubicon is the river now known as the Fiumicino.

Rubidium (*rōō-bĭd'ĭ-ŭm*), one of the alkali metals. It was discovered by Bunsen and Kirchhof in 1860, while examining the waters of Dürkheim, Germany, by means of the spectroscope. This mineral occurs in minute proportions in association with caesium. It is silver white, is as soft as wax at ordinary temperatures, and oxidizes rapidly in the air. When raised to a dull red heat, it gives off a bluish vapor.

Rubinstein (*rōō'bĭn-stīn*), ANTON GREGORIEVICH, composer and pianist, born in Wechwotynetz, Rumania, Nov. 28, 1829; died in Peterhof, Russia, Nov. 20, 1894. After receiving his first musical education from his mother, he studied in Moscow, Paris, and Berlin. In Paris he studied with Liszt and in Berlin with Dehn. Rubinstein taught music in Vienna and later in Berlin. In 1848 he settled in St. Petersburg (now Leningrad), where he became (1858) conductor of the Imperial Concert and founded (1862) the Imperial Conservatory. Rubinstein's fame as a piano virtuoso reached its peak in the late 1860's and early 1870's. His tour of the U.S. and Canada in 1872-73 met with enormous enthusiasm. He found the experience artistically depressing, however, and refused all invitations to return. Rubinstein received many awards and honors, one of which, the Order of Vladimir, raised him to the Russian nobility. His compositions, little known today, include oratorios, operas, symphonies (notably the "Ocean Symphony"), and chamber music.

ANTON RUBINSTEIN

Rubinstein (*rōō'bĭn-stīn*), ARTUR, pianist, born in Lodz, Poland, Jan. 28, 1886. He studied in his native city and at the Berlin Acad. of Music, where he was a violin pupil of Joseph Joachim, a piano student of Heinrich Barth, and a student of composition under Max Bruch. A child prodigy, he gave his first concert in Warsaw when he was only six years old and made his debut with the Berlin Symphony Orchestra while he was still a child. He made his first concert appearance in the U.S. in 1906 with the Philadelphia Symphony Orchestra. He studied in Paris from 1906 to 1910, and since then has devoted his entire life to study and concert tours. He is best known for his interpretations of the works of Brahms and Chopin.

Ruble (*rōō'b'l*), or ROUBLE, the unit of the Russian monetary system, first cut from silver bars in 1321, and first coined in 1655. Although the ruble is coined in silver, the circulation is largely composed of paper money. Before the revolution of 1917, the ruble was divided into 100 kopecks. In 1924 Soviet currency was stabilized on the basis of the gold ruble, 10 of which equaled one *chervonetz*. In 1936, a new gold ruble, based on the French franc, at the rate of three francs per ruble, was substituted for the *chervonetz*. After World War II the value of the ruble was kept at 19 cents until March 1950, when it was raised to a value of 24 cents, approximately four to one U.S. dollar. See also *Coins*.

Rubric (*rōō'brĭk*), from the Latin *rubrica*, meaning "red earth." It refers to that part of a page or chapter printed in red, or in some distinctive type. *Rubrics* also include titles or headings of written or printed documents (statutes, judicial reports, etc.), also liturgical directions in prayer books, all of which particular passages are distinguished by red coloring or other devices.

Ruby (*rōō'by̆*), a transparent gem of a deep red, which is considered one of the most valuable of the precious stones. It is a species of sapphire, but differs from it in that the sapphire has a bluish color and is less hard, ruby being the hardest of all gems except the diamond. Ruby is rare, is seldom found of large size, and possesses great value. The value increases in proportion to its size. Ruby of the kind described here is generally called *oriental* ruby to distinguish it from a less valuable variety known as *spinel ruby*. Rubies are obtained in Burma, Siam, Ceylon, and Australia. Inferior grades occur in America and also in the countries named. It is now possible to produce rubies chemically. The artificial kinds are as satisfactory in watches as rubies produced in nature.

Rudder (*rŭd'ẽr*), a broad, flat device by which a boat or ship is steered, serving to change its course when swung to either side. It is hinged vertically to the stern post of a ship, or at the stern of a boat, and is so adjusted that it may be moved by means of a tiller or wheel. A rudder chain is shackled to the rudder by bolts immediately above the water line, but it is slack enough to permit the free motion of the rudder. This is necessary to prevent it from being lost in the event of its becoming detached from the ship.

Rude (*rüd*), FRANÇOIS, sculptor, born at Dijon, France, Jan. 4, 1784; died Nov. 3, 1855. He first studied art in his native town and subsequently at the École des Beaux Arts in Paris. Although he was awarded the *Prix de Rome* (1812), the financial strain on the Académie de France in Rome did not permit his studies there. Only as a mature man did he visit Italy (1842). His statue, "Neapolitan Fisher Boy Playing with a Tortoise," later brought to the Louvre, established his fame in 1833. Rude's works include a great many portraits and busts, among them those of Napoleon, the sculptor Houdon, and Marshals Ney and Bertrand. The artist's strong temperament is expressed best in the monumental group, the *"Départ des Volontaires de 1792,"* on the Arc de Triomphe in Paris, for which structure Rude also did all the ornament. His style developed from severe classicism to a temperamental, rather baroque, naturalism, which, at the end of his life, he blended with his earlier approach, thus becoming strongly influential on the following generation of French sculptors.

Rudolph I (*rū'dôlf*), or RUDOLF, of Hapsburg, German king, born in Limburg, Germany, May 1, 1218; died in Germersheim, July 15, 1291. He was the son of Albert IV, Count of Hapsburg and Landgrave of Alsace. Elected King of Germany (1273), he won the recognition of Pope Gregory X by renouncing the sovereignty of Rome, the Papal States, and Sicily. He consolidated his power by defeating (1278) Ottakar of Bohemia (who refused to acknowledge him), and by investing his sons with Austria and Styria, thus laying the foundation of the Hapsburg dynasty (1282).

Ruff (*rŭf*), a genus (*Machetes pugnax*) of birds allied to the sandpiper. The female is called the *reeve*. The ruff is widely distributed in northern Europe and Asia, inhabiting marshy places and nesting on the ground. It migrates as far south as Africa in winter. The body is *ca.* 10 in. long, the bill is long and slender, and the wings are short. In color the birds vary widely, having feathers of black or shades of brown above and white below. The male bird gets its name from its long feathered neck ruff, which develops during the spring breeding season and which serves as a protection in the fierce battles fought among male birds for possession of a female.

Rug (*rŭg*). See *Carpet.*

Rugby (*rŭg′by̆*), a municipal borough in Warwickshire, England, on the Avon River, *ca.* 80 m. N.W. of London. It is an important rail center and the site of engineering works and a major radio transmitter; its industries include the manufacture of electrical equipment. The region is a noted hunting center. The settlement of Rubgy dates back to the 11th century and is mentioned in the Domesday Book (1086). Its chief fame is as the site of Rugby School, one of Great Britain's leading public schools.

Rugby School was founded in 1567 through a bequest of Lawrence Sheriff, a prominent merchant. It first attained a national reputation under the headmastership of Thomas Arnold (*q.v.*), who took office in 1827. Arnold, the father of the poet Matthew Arnold, reorganized the administration of the school and reoriented its objectives toward the building of character among the student body, an innovation which soon had strong influence on other British public schools. An account of the school in Arnold's time is contained in the novel "Tom Brown's School Days" (1857), by Thomas Hughes, a statue of whom stands on the school grounds. In addition to Hughes, the school's noted alumni include Matthew Arnold, Rupert Brooke, and C. L. Dodgson (Lewis Carroll). Rugby today has *ca.* 700 students. The present buildings date from the 19th century; the original chapel has been rebuilt several times. Another chapel honors Rugby alumni who died in World War I.

Rugby football originated at the school in 1823, when William Webb Ellis, disregarding the rules of conventional football, first took the ball in his arms and ran with it, thus initiating the distinctive feature of the game.

Population, 1951, 45,418.

Rügen (*rü′ḡẹn*), an island of Germany in the Baltic Sea (in the Russian Zone), separated by a narrow channel from the mainland. The island, with an area of 374 sq. m., is very irregular in shape and indented by numerous bays; there are no conspicuous elevations. Rügen has ferry connections with Germany and Sweden. A popular vacation spot, it produces vegetables and cereal grains. Cattle and sheep are reared, and fishing is an important industry. The principal town is Bergen. From 1648 to 1815 the island belonged to Sweden. Population, 1946, 90,740.

Ruhr (*ro͞or*), a river of western Germany, flowing 145 m. in a westerly direction and joining the Rhine at Duisburg-Hamborn. The valley of the Ruhr, or *Ruhr District,* is rich in coal deposits, and its many cities, including Essen, Dortmund, Gelsenkirchen, Bochum, and Duisburg-Hamborn (*qq.v.*) are crowded with steel mills, locomotive works, and other industrial plants, of which the best known are the Krupp factories. The district was of great importance in both World Wars as a center of armament production. It was occupied (1923-25) by French and Belgian forces because of Germany's failure to pay reparations. In World War II the entire district suffered severe damage from bombing. It was surrounded and isolated during the Allied advance in the spring of 1945 and completely occupied by April 18. It was later included in the British Zone of occupation. In 1949 an International Authority for the Ruhr was established by the U.S., Great Britain, France, and the Benelux countries for the regulation of the district's coal and steel production. This authority was superseded on July 25, 1952, by the organization of the Schuman Plan (*q.v.*) for the pooling of the coal and steel industries of six Western European nations.

Rukh (*ro͞ok̨*). See *Roc.*

Rum (*rŭm*), an alcoholic liquor distilled from the juice of sugar cane and from the drainings and scummings obtained in sugar making. The material used is first allowed to ferment and the liquor is then drawn off by a simple process of distillation, which is usually conducted in connection with the cane-sugar establishments. The best grade of rum is secured from the scummings taken from the sugar pans, a second grade is made from scummings and molasses, and an inferior grade is obtained from molasses alone. Rum is colorless as it issues from the still, but it is colored to suit the customer before it leaves the premises of the distiller. The most extensive productions are in connection with the manufacture of cane sugar in the West Indies and Central America, but inferior grades are made by flavoring plain spirit with rum and coloring with burnt sugar. *Jamaica rum* is considered the finest, but in late years the name has been applied to the best grades made anywhere. A pineapple flavor is often given to rum by bringing it in contact with sliced pineapples, when it is called *pineapple rum*. The French make a kind of rum known as *tafia*.

Rumania (*rōō-mā'nĭ-ȧ*), ROMANIA, or ROUMANIA, a republic in the southeastern part of Europe, one of the Balkan states. It is bounded on the N. by Poland and Czechoslovakia, E. by Soviet Russia and the Black Sea, S. by Bulgaria, and W. by Yugoslavia and Hungary. The coast on the Black Sea is about 130 m. long. It is separated from Bulgaria by the Danube. The area in 1939 was 113,884 sq. m.

Description. The western part is mountainous, being traversed by the Carpathians and the Transylvanian Alps. Much of the surface is a low plain, but spurs of these mountains extend some distance inland. The highlands in the northern part serve as a great wall on the Czechoslovakian frontier, the highest peaks rising about 8,000 ft. above sea level. These highlands are cut deeply by river channels, which flow in valleys between spurs of the mountains. In the eastern part of the country is the Moldavian plain, and the Wallachian plain occupies the southern region, both of which are highly fertile.

All of Rumania lies in the Danube basin. The drainage is toward the south and east into the Black Sea. A part of the western and most of the southern boundaries are formed by the Danube River, which turns northward near Silistria, and, after being joined by the Pruth, it forms the boundary between the province of Dodrudja and Russia. The greater part of the Danube delta is included within Rumania. It contains the celebrated wall built by the Romans under Trajan in the 2d century from the vicinity of Kustenji to the Danube. Other rivers are the Mures, Olt, and Sereth. Many small streams flow south from the northern border to join the Danube, including the Aluta, the Arjesh, and the Sereth.

The climate is subject to marked extremes. The summers are hot, the autumns are dry, and the winters are cold. In winter the winds blow from the Russian steppes and in summer from the Mediterranean, making the summers subtropical. The extremes range from 20° below zero to 98° and even 104° in the shade. The rainfall ranges from 15 to 22 in., but is not equally distributed. Much of the surface is highly fertile, particularly the black earth of the Danube basin. The terrain is for the most part covered with a fine growth of timber.

Mining. Rumania possesses vast mineral wealth, chiefly in coal, petroleum, and salt. The country ranks as one of the world's leading oil producers; many of the oil wells have been promoted by foreign capital. Among the principal oil fields are those at Ploesti, about 45 m. N. of Bucharest; others are located at Prahora, Bacau, Buzau, etc. Coal and natural gas are also obtained both for domestic and foreign consumption. Other minerals include iron, gold, copper, lead, silver, and quicksilver. Clays suitable for brick and pottery, and sands fitted for porcelain and glasswares are abundant. Granite, marble, and limestone are widely distributed and these minerals are quarried to a considerable extent for construction purposes. Some of the salt beds in the Moldavia and Wallachia regions have a thickness of 700 ft. Salt mining is a state monopoly.

Courtesy Ewing Galloway, N. Y.

FERTILE PLAINS OF RUMANIA

Corn and wheat are the leading agricultural products of the country

Courtesy Ewing Galloway, N. Y.

STREET SCENE IN BUCHAREST, CAPITAL OF RUMANIA

Agriculture. Approximately three-fourths of the population are engaged in farming and stock-raising. The principal crops are wheat and maize; other important farm products include barley, oats, rye, tobacco, hemp, and vegetables. Fruit growing is likewise important, the chief fruits being grapes, prunes, and apples. Sheep are raised in large numbers in the highlands in the north. Cattle are raised for meat and dairying, while other livestock are horses, swine, and poultry.

INDUSTRY AND COMMERCE. In Rumania, as in most countries, the factory system had first to compete with small home establishments, and ultimately it surpassed them. Today large-scale manufacturing enterprises produce flour, sugar (made from native beets), dairy products, wines, soap, leather, cement, glass, textiles, hosiery, machinery, and cigars. Extensive petroleum refineries are operated. The balance of foreign trade in normal times is generally favorable since the exports (petroleum products, flour, liquors, livestock, hides, fruits, etc.) exceed the imports (textiles, metal products, etc.).

COMMUNICATION. The Danube River is important as a highway of commerce, furnishing a continuous route from the Black Sea to the western border. It has been improved in many places by dredging and canals. Deep-water navigation on the Danube extends to Galatz and Braila. Constanta, on the Black Sea, has direct railway communication with the interior, where lines of railroads extend in all directions, furnishing communication with commercial centers in neighboring European countries. Before World War II about 9,500 m. of railways were in operation; these were owned and operated by the state. Bucharest, Jassy, and other cities have extensive railway systems, many of which extend to rural districts and interior towns. Rumania has over 65,000 m. of highways, telephone and telegraph communications, and three radio stations.

GOVERNMENT. According to the Constitution of 1938, the government was a constitutional monarchy. In December 1947, a People's Republic was proclaimed after the abdication of King Michael. In April 1948, a new Constitution, based on the Soviet pattern, was adopted.

For the purposes of local government Rumania is divided into 11 provinces by decree of Feb. 10, 1942. Provincial governments in these divisions were empowered to administer all local affairs.

EDUCATION. Despite laws for free and compulsory school attendance, illiteracy, especially among the adult population, is widespread. There exist elementary public and private schools, fewer secondary schools, trade and agricultural schools. In the field of higher education, sufficient normal schools for the training of teachers are lacking. However, there are four universities, located at Bucharest, Cluj, Jassy, and Cernauti (Czernowitz).

INHABITANTS. The Rumanians call themselves *Romani* and are descendants of a colony of Romans established by Trajan. At present the language spoken consists of many dialects, but may be classed generally with the Romanic tongues. Population groups include about 72 per cent Rumanians, 8 per cent Magyars, 4 per cent Germans, 4 per cent Jews, and smaller numbers of Bulgarians, Turks, and Gypsies. Freedom of worship exists, although the Orthodox Churches predominate. Bucharest is the capital and the largest city. Other important cities include Jassy, Galati, Cluj, Cernauti, and Ploesti. Population in Jan. 1948 (estimate), 15,872,624.

HISTORY. The region now included in Rumania formed part of Dacia in ancient times. Trajan made it a province of Rome in 106 A.D., when extensive Roman colonies were established. It was overrun by the military hordes of barbarians, including the Goths, Huns, Bulgars, and Slavs, in the early centuries of our era. All left traces of their occupation on the people and architecture to the present time. The Bulgarian kingdom annexed it in the 9th century, but it was joined to the Eastern Roman Empire, in 1019, and soon after became a part of Turkey. Turkish occupation was disturbed at various times by insurrections and wars. With the beginning of hostilities between Russia and Turkey, in 1768, Turkish influence began to wane. This may be attributed to the fact that both the Rumanians and Russians belong largely to the Greek Church, and Russia claimed a protectorate over its fellow Christians against Turkish atrocities committed in the Balkan region.

The Crimean War (*q.v.*) was followed by the Treaty of Paris, in 1856, which, while recognizing the suzerainty of Turkey, added a part of Bessarabia to the principalities of the Danube and made ample provision for maintaining the rights and privileges of the Balkan States. Dependencies of Turkey for hundreds of years, Moldavia and Wallachia were united under Prince Alexander Cuza in 1859 and in 1861 the name "Rumania" was adopted. At the beginning of the Russo-Turkish War, in 1877, Rumania permitted the free passage of Russian troops across its territory, which action caused Turkey to proclaim war against the Rumanians.

The Treaty of Berlin, in 1878, recognized the independence of the united provinces of Moldavia and Wallachia and approved the annexation of Dobrudja, in return for which Bessarabia was ceded to Russia. Charles (Carol) was chosen Lord of Rumania in 1866 and was proclaimed King Carol I in 1881. On his death, in 1914, he was succeeded by Ferdinand I, who ruled until his death in 1927. Rumania joined the Allies in 1916, met defeat and, in 1918, negotiated a peace treaty, which was repudiated when the Central Powers were defeated. In the final settlement Rumania received territory from Russia, Bulgaria and Austria-Hungary. The combined effect of the

U. S. Army Air Forces Photo

RUMANIAN OIL REFINERY UNDER ALLIED BOMBARDMENT DURING WORLD WAR II

The country is one of the world's leading oil producers

treaties was practically to double Rumania's population and area.

Before World War II, Rumania, enlarged territorially and heterogeneous in population, underwent a period of internal changes and a vacillating foreign policy. Upon King Ferdinand's death in July 1927, Michael (Mihai) succeeded to the throne under a regency, since his father, Prince Carol, had renounced his own right of succession two years earlier. However, in 1930, Carol ascended the throne and Mihai received the title of Great Voevod of Alba Julia, but became king once again on his father's abdication on Sept. 6, 1940. Ex-King Carol left Rumania to reside in Mexico.

Carol's 10-year regime produced no clearly defined policies but a gradual drift toward Fascism, and abounded in assassinations, pogroms, and general unrest. During this time Rumania ceded territory to Hungary and Bulgaria (at Italian-German demands), and to Russia. A *coup d'etat* of the pro-Nazi *Iron Guard* made Gen. Ion Antonescu chief of state (Sept. 1940). Antonescu took over all executive powers, abandoned the constitution, and set up the "National Legionary State," making the country a dictatorship, virtually a German vassal state. In 1941, Rumania joined Germany in the invasion of Soviet Russia. By October 1941, Rumania had retaken Bessarabia and even conquered Russian territory formerly not belonging to Rumania, incorporating her conquests into a region called Transdniestria. In December 1941, Rumania declared war on Great Britain and the U.S. In subsequent Russian counterattacks, the Rumanian forces were driven out of Russia, and Rumanian oil supplies suffered heavily from Allied air attacks (*e.g.*, Ploesti oil fields) and Russian ground forces. Antonescu was ousted by King Michael and imprisoned in August 1944. A new government (Aug. 1944) prepared the way for an armistice (signed in September), declared war on Germany and Japan, and continued the war on the side of the Allies, thus regaining Transylvania from Hungary (Mar. 1945).

As a result of the Moscow Conference, held in December 1945, a tripartite commission was sent to Rumania to advise the king in broadening his government. On Jan. 7, 1946, one representative each from the Peasant party and the Liberal party was added to the cabinet, and on Feb. 5 both the U.S. and Great Britain provisionally recognized the new government on the condition that it hold free elections. On Nov. 19, 1946, these elections were held, with Rumanian women voting for the first time in the country's history. The Government Bloc—made up of Communists, Ploughman's Frontists, Socialists, and dissident Liberals—won more than two-thirds of the 6,823,928 votes cast. However, both the U.S. and Britain registered protests, charging that the elections were not free. Rumania thereafter followed closely the pattern of the other nations under Soviet influence, in refusing to participate in the Marshall Plan.

The Peace Treaty officially ending the war was completed by the Council of Foreign Ministers on Dec. 12, 1946, being signed on Feb. 10, 1947. Under the terms of the treaty the Rumanian army was fixed at a maximum of 120,000 men, the navy at 5,000 men, and the air forces at 8,000 men; Rumania was to pay Russia $300,000,000 in reparations (Russia later reduced the amount by half); Southern Dobrudja was ceded to Bulgaria; and both Northern Bukovina and Bessarabia were ceded to Russia.

Rumania became a "people's republic" on Dec. 30, 1947, when Michael I (*q.v.*) was forced to abdicate. Thereafter, the country fell completely under the domination of Soviet Russia; in 1955 she adhered to arrangements for a unified military command under the direction of Moscow. Although Rumanian relations with the Western Powers grew increasingly strained, the country became a member of the U.N. in 1955.

Rumelia (*rōō-mē'lĭ-ȧ*), or ROUMELIA, a region of Southern Europe, extending from the Black Sea to Albania and from the Balkan Mts. to the Aegean Sea. *Eastern Rumelia* long formed a part of Turkey, but, by the Treaty of Berlin, in 1878, its government under Turkey became autonomous. Following a revolution in 1885, it was united with Bulgaria (*q.v.*).

Rumford (*rŭm'fẽrd*), including Rumford Falls, town of Oxford County, Maine, on the Androscoggin River and on the Maine Central R.R. It has large paper and pulp mills and manufactures U.S. government postal cards. It was incorporated in 1895. Population, 1950, 7,888.

Rumford, COUNT (born BENJAMIN THOMPSON), scientist and administrator, born in Woburn, Mass., Mar. 26, 1753; died in Paris, Aug. 21, 1814. During the American Revolution, his strong Royalist sympathies forced him to leave America for England (1776), where he became Under-Secretary for the Colonies. He was knighted in 1784 and was made a count of the Holy Roman Empire in 1791. He was in the service of the elector of Bavaria (1784-95) and enacted many civil and military reforms in his capacity of commander-in-chief of the general staff, minister of war, and superintendent of the police of Bavaria.

He is best remembered for his interest and experiments with explosives, light, and heat. He helped to organize the Royal Institution (1880), and originated several medals for research in light and heat. These Rumford medals are awarded by the Royal Society of London and by the American Acad. of Arts and Sciences.

Ruminants (*rōō'mĭ-nạnts*), the name of a large group of grazing animals, distinguished by the fact that they chew a cud. They were classed as *Ruminantia* by Cuvier, but are now regarded as a group of the cloven-hoofed, or even-toed, ungulates. Nearly all the animals of this group have a stomach composed of four distinct bags, or cavities, but in some it is divided imperfectly into four chambers, while in others there are only three cavities. When grass or other food is swallowed, it passes by the gullet into the largest cavity of the stomach, called the *paunch*, or *rumen*, where it is soaked with a fluid. The second pouch, which is connected with the gullet, receives the fluids direct, though in some species a part of the liquids enters into other cavities. A direct connection also exists between the gullet and the third pouch, which is lined with a membrane which has many deep folds and hard tubercles. The fourth cavity, called the *reed*, or *rennet*, is lined with a mucous membrane that secretes the gastric juice.

The food passes at the will of the animal into the first or second cavity, but such foods as hay and grasses are deposited in the former, the paunch. When this is well filled and the animal is at rest, a portion is brought up and chewed slowly between the large molar teeth. This process, called *chewing the cud*, or *ruminating*, may occur when the animal is standing or lying down. After the food is chewed and thoroughly mixed with saliva, it is reswallowed and passes by the first two pouches into the third, whence it passes on into the fourth pouch and finally into the intestines. All the cloven-hoofed herbivorous animals, except the swine and hippopotamuses, are ruminants. They include the antelopes, camels, cattle, deer, giraffes, goats, musk ox, and sheep.

Rump Parliament (*rŭmp pär'lĭ-mẹnt*), the popular name given in English history to a remnant of the Long Parliament. The soldiers under Cromwell expelled three-fourths of the members of Parliament on Dec. 6, 1648, these being known as Pride's Purge, while the remaining 60 members constituted the Rump Parliament. This body cooperated with Cromwell in the trial and condemnation of Charles I. After resisting certain encroachments of the army, this body was dissolved, in 1653, but was restored during the protectorate of Richard Cromwell. It was again expelled in 1659, was restored in 1660, and finally dissolved by its own decree on Mar. 16, 1660.

Rundstedt (*rōōnt'shtĕt*), KARL RUDOLF GERD VON, soldier, born in Aschersleben, Germany, Dec. 12, 1875; died in Hanover, Feb. 24, 1953. He attended the Cadet School at Potsdam and served with the German General Staff in World War I. He served with the Reichswehr and in World War II commanded the offensive in southern Poland (1939), later commanding forces in France (1940) and in Russia (1941). In 1942, Hitler named him commander-in-chief of the German army of occupation in France. For about a month after the Allied invasion of Normandy (June 6, 1944), Rundstedt was German supreme commander on the western front. He later headed the commission which tried the German Army officers who made an assassination attempt on Hitler (*q.v.*). Rundstedt directed the abortive German offensive in the Ardennes (*q.v.*), known as the Battle of the Bulge (December 1944-January 1945), which he later insisted was doomed to failure because of the unattainable objectives demanded by Hitler. Indicted for war crimes by the Allies, he was never tried, because of illness, and was released in 1949.

Runeberg (*rōō′nę-bĕr-y′*), JOHAN LUDWIG, Swedish poet, born at Jacobstad, Finland, Feb. 5, 1804; died at Borgå, May 6, 1877. He was born only five years after Sweden lost Finland to Russia, the son of a sea captain who provided him with a good education, which included an extensive research in literature and a knowledge of Greek. In 1830 he was made teacher of Latin literature in the University of Åbo, which had been removed to Helsingfors three years earlier after fire destroyed the buildings at Abo. In 1837, he went to Borgå Coll. to teach Latin and he remained at that institution until his death. Although he left Finland only once during his lifetime, he always wrote in Swedish and is known as the most eminent of Swedish poets. His poems attained the highest ideal of imaginative literature in Sweden. Among his best-known works are: "The Elk-Hunters," an epic idyl, "King Fjalar," "Christmas Eve," "Ensign Steel's Stories," and "Hanna."

Runes (*rōōnz*), a system of writing used among the Germanic peoples at an early date, of which mention was first made in the 6th century A.D. It consisted of 16 letters, but the number of characters was extended later by the Germans to 24 and afterward to 40. Many inscriptions in the runes have been found in various parts of Europe. In Sweden these inscriptions are chiefly on rock or stone monuments, of which many specimens have been found in the vicinity of Upsala. These inscriptions are in Icelandic with runic characters. In Denmark verses have been found engraved upon monuments, but in some localities they are on arms, amulets, wooden tablets, and instruments of various kinds. Runic manuscripts, including a collection of laws written in the 13th century, are preserved in the library of the Univ. at Copenhagen. An Icelandic prayer that victory should crown the arms of Herold against the Swedish king Sigurd, in 735, was discovered on a rock in the southern part of Sweden. Writings of this character were found in some parts of England, especially in the regions formerly known as Mercia and Northumbria. Since magical influences were attributed to the runic writings, they were succeeded by other systems through the influence of Christian missionaries, though a few Christian inscriptions in the runic characters have been discovered.

Runjit Singh (*rŭn-jēt′ sĭng′*). See *Ranjit Singh.*

Runnymede (*rŭn′nĭ-mēd*), or RUNNIMEDE, a narrow strip of meadow land on the bank of the Thames, in the northwestern part of the county of Surrey, England. It is memorable as the place where King John, in 1215, was compelled by his barons to grant the privileges of the Magna Carta. This tract of land now contains the Egham race course, so named from the town nearby.

Runyon (*rŭn′yŭn*), (ALFRED) DAMON, newspaper columnist and author, born in Manhattan, Kans., Oct. 4, 1884; died in New York City, Dec. 10, 1946. For many years, Runyon was associated with the Hearst newspapers as a feature writer. He used Broadway as a setting for his many well-known short stories, poems, and syndicated articles. The setting and characters were later used in the musical comedy "Guys and Dolls" (1950).

Rupee (*rōō′pē*), a coin of India. See *Coinage* (Value of Foreign Units).

Rupert (*rōō′pĕrt*), PRINCE (COUNT PALATINE OF THE RHINE AND DUKE OF BAVARIA), third son of Frederick V, king of Bohemia, and of Elizabeth, daughter of James I of England, born in Prague, Bohemia, Dec. 17, 1619; died in London, England, Nov. 29, 1682. He was reared in Holland, educated in Leyden, and served in the Thirty Years' War against the emperor until he was captured in 1638 and imprisoned for three years.

When civil war broke out in England, he went (1642) to the aid of Charles I and was a successful commander of cavalry until his defeat at the battle of Marston Moor (1644). After this defeat, he began to doubt the king's cause; Charles, however, appointed him general of the army (1644), in spite of resentments between Rupert and the king's advisers. Rupert was again defeated at Naseby (1645). His surrender to Thomas Fairfax (*q.v.*) at Bristol (1645) caused the king much disillusionment, and Rupert was forced to leave England (1646). He went to France and there commanded English troops in exile. For this loyalty to Charles, Rupert was given a fleet of ships to assist the king's forces in Ireland. A long naval campaign followed, during which Rupert's ships were pursued by Robert Blake (*q.v.*) to the Mediterranean (1650), and nearly all of Rupert's ships were lost.

After the Restoration, Rupert settled in England and was named first governor of the Hudson's Bay Co. (*q.v.*) in 1670. As a vice admiral, Rupert later fought brilliantly in the Dutch Wars, and he served as first lord of the admiralty (1673-79). English titles granted to him were duke of Cumberland and earl of Holderness.

His later years were devoted to scientific study and to art. He is credited with making improvements in the art of mezzotint, which he introduced into England. From him, the glass bubbles known as Prince Rupert's drops derive their name. He also invented a form of brass called Prince Rupert's, or prince's, metal.

Rupert's Land (*rōō′pĕrts lănd*), an extensive region of Canada, so named from Prince Rupert, who was one of the founders and first governor of the Hudson's Bay Co. The region includes what is now Manitoba, Alberta, Saskatchewan, and a large part of Keewatin. Subsequently it was transferred to the Hudson's Bay Co. and in 1870 was admitted into the Dominion of Canada. See also *Hudson's Bay Company*.

Rural Electrification Administration (*rōōr′al ē-lĕḳ-trĭ-fĭ-ḳā′shŭn ăd-mĭn-ĭs-trā′shŭn*), an independent agency created in 1935 and included in the U.S. Dept. of Agriculture (*q.v.*) in 1939. By the end of 1961 the R.E.A. had approved self-liquidating loans to more than 1,750 locally owned, primarily cooperative, electric and telephone systems in 46 states, Puerto Rico, and the Virgin Islands. Total loan funds of more than $5,300,000,000 have financed construction of central-station electric service facilities to 1,677,000 subscribers.

Borrowers have made payments of more than $1,500,000,000 on their loans, including interest payments of $533,500,000. In 1961, *ca.* 97 per cent of all U.S. farms received central-station electric service, against 10.9 per cent in 1935. More recently, the emphasis has been primarily on loans for generation and transmission purposes in rural areas.

Rush (*rŭsh*), the name of several plants belonging to the sedge family. Most species are grasslike herbs with jointed stems. They are either leafless or bear flattened, knotted leaves and greenish or brownish flowers. The *common rush* has a perennial root and the stem is filled with a spongy pith. A species known as *black grass* is cut for hay early in the season. Many of these plants are valuable in industry, since they furnish material for mats, thatching, twine, and chair bottoms. They grow in moist meadows and swampy places.

Rush, BENJAMIN, physician, born in Philadelphia, Pa., Dec. 24, 1745; died Apr. 19, 1813. He was descended from a family of Quakers that came to America with William Penn in 1683, and, after being graduated from Princeton in 1760, he studied two years in Edinburgh, Scotland, where he secured a degree in 1768. Soon after he returned to America. He became professor of chemistry in the Philadelphia Medical Coll. and at the same time built up a reputation as medical practitioner. In 1774 he joined James Pemberton in founding the first anti-slavery society in America, and became a leading spirit in the political movements preceding the Revolution. He served as a member of the Continental Congress, in 1776, and was a signer of the Declaration of Independence. Until 1778 he was physician general of the army, and in 1787 sat as a member of the Philadelphia convention that adopted the Federal Constitution. His last public office was that of treasurer of the U.S. mint in 1799, serving in that position until 1813. Among his numerous writings are: "Diseases of the Mind," "Medical Inquiries and Observations," and "Medical Tracts."

Rusk (*rŭsḳ*), DEAN, government official, educator, born in Cherokee County, Ga., Feb. 9, 1909. He was graduated from Davidson Coll. (1931) and, as a Rhodes Scholar, from St. John's at Oxford (1934); from 1934 to 1940 he was associate professor of government and dean of faculty at Mills Coll. He joined the U.S. State Dept. in 1946 as assistant chief of the Division of International Security Affairs and—with the exception of a position in the War Dept. (1946-47)—remained a member of the State Dept. staff until 1951. As Assistant Secretary for Far Eastern Affairs (1950-51), he participated in many key decisions concerning the Japanese peace treaty, the defense of Formosa, and the Korean war. He served as president of the Rockefeller Foundation from 1952 to 1960; in the latter year he was appointed Secretary of State in the Kennedy administration, taking office in 1961.

Ruskin (*rŭs′ḳĭn*), JOHN, author and art critic, born in London, England, Feb. 8, 1819; died Jan. 20, 1900. He was the son of a wealthy wine merchant and was instructed privately until he entered Oxford Univ., whence he was graduated in 1842. While at school he manifested a taste for literature and art. He studied painting under Copley Fielding and received inspiration from the works of Rembrandt and Rubens. His whole life was one of busy study and work. The first important work from his pen was his "Modern Painters," the first volume of which appeared in 1843, although he had previously published his poem, "Salsette and Elephanta," which gained the Newdigate Prize at Oxford. His intention when he began writing "Modern Painters" was to call attention to the superiority of modern landscape painters, especially Turner, to the older masters, but by the time the five-volume work was finished in 1860, he had developed a complete system of the theory and principles of art. Meanwhile he had been studying architecture, and, in 1849, he published "Seven Lamps of Architecture," a work which bears the same relation to that field as "Modern Painters" bears to painting. He followed this book with "Stones of Venice," the last volume of which appeared in 1853.

Through his study of medieval art, he learned to appreciate the specific values of handicraft, in contrast to the methods of standardized machine production. In connection with these aesthetic evaluations, he began to think about the social conditions under which the great medieval art and artisanship originated. Thus, he gradually turned to social and sociological research, which led him (after 1860) to devote his attention almost exclusively to the economic betterment of the English working class, although from 1869 to 1879 and again in 1883-84 he was professor of art at Oxford Univ. One of his Utopian schemes was St. George's Guild, which he founded at Oxford with the purpose of implanting the habit of

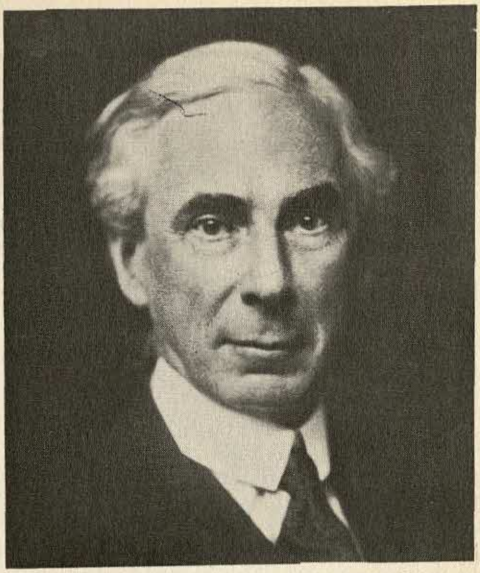
JOHN RUSKIN

Painting by Hubert von Herkomer (1849-1914)

manual labor in young and old. During this period of his life, Ruskin wrote books and pamphlets on political economy and the social and industrial problems of contemporary society. Today his ideas appear to us rather romantic and antiquarian, since we no longer believe in the possibility of turning social and economic development backward. We prefer to develop new forms of art out of given modern social conditions and contemporary methods of production.

Ruskin's most noteworthy works include: "The King of the Golden River," a fairy story; "Pleasures of England," "Mornings in Florence," "Ethics of the Dust," "Queen of the Air," "Poetry of Architecture," "St. Mark's Rest," "Arrows of the Chase," and his autobiography, "Praeterita."

Russell (*rŭs′ĕl*), BERTRAND ARTHUR WILLIAM, 3RD EARL RUSSELL, VISCOUNT AMBERLEY, mathematician, logician, and philosopher, born at Trelleck, England, May 18, 1872. He was educated at Trinity Coll., Cambridge Univ., 1890-94, and in 1895 was elected a fellow of Trinity Coll. Under the influence there of Alfred North Whitehead he became interested in the philosophy and foundations of mathematics and in mathematical or symbolic logic. The latter subject is to be regarded as the modern successor of traditional formal logic (which it includes as an elementary branch). It was then still widely unknown, though it had already made important advances in the work of the Italian mathematician, Giuseppe Peano (1858-1932), and the German logician, Gottlob Frege (1848-1925). Whitehead's first publications in this field had been from the point of view of the older "algebra of logic," but dating from their contact with Peano at the international congresses of philosophy and of mathematics at Paris (Aug 1-12, 1900) an important change is traceable in the direction of Whitehead's thought, and Russell's own research in logic has its substantial beginning. With the earlier and more profound work of Frege they became acquainted two years later, and only after Russell had reached, independently, many of the same ideas as Frege.



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BERTRAND RUSSELL

Russell's "The Principles of Mathematics" (1903) outlines a proposed demonstration of his thesis—which had been partially anticipated by Frege—that the technical terms of mathematics are capable of definition from logical terms alone, and in such a way that the theorems of mathematics can then be proved by means of pure logic (without special mathematical axioms). In the same book there is pointed out a formal inconsistency arising in the logical system of Frege, and likely to arise in others, from the now famous "Russell paradox" concerning "the class of those classes which are not members of themselves." In the years immediately following, much of Russell's thought was devoted to the problem of a modification designed to avert this threat of self-contradiction in a system of logic. His solution, published in 1908, is the "theory of logical types."

The program of the "Principles" to derive mathematics from logic is carried out in detail, though in a somewhat weakened sense, by Whitehead and Russell in the three volumes of "Principia Mathematica" (1910-13). This treatise, which remains a classic in the field of foundations of mathematics, is important also for the far-reaching influence which certain of its technical results had upon Russell's later work in metaphysics and the theory of knowledge.

Russell was appointed a lecturer at Trinity Coll., Cambridge, in 1910. During World War I he was active in opposition to conscription. A leaflet advocating pacifism cost him a fine, and Trinity Coll. deprived him of his lectureship in 1916. Offered a post at Harvard Univ., he was refused a passport. In 1918, he spent some months in prison for a pacifist article. His expository "Introduction to Mathematical Philosophy" (1919) was written during his imprisonment, but his creative work in logic had come to an end. Though the necessity may be admitted of such forcible suppression of opinion in the midst of a major war, it must also be said that the effect on Russell's career of these incidents (especially the forfeiture of his academic position) was disastrous and the resulting loss to scientific and philosophical thought perhaps irreparable.

Thereafter, Russell turned increasingly to writing on topics of general philosophical interest and on sociology and education. Presenting his views on matters of politics, religion, marriage and sexual morality, he published, among others, "Why Men Fight" (1917), "What I Believe" (1925), "Marriage and Morals" (1929), "Unpopular Essays" (1950), "The Impact of Science on Society" (1953), and "Portraits from Memory and Other Essays" (1956). But there were also genuine contributions to philosophy, on which his claim to greatness as a philosopher rests. The most important of these are "The Problems of Philosophy" (1912), "Our Knowledge of the External World" (1915), "Analysis of Mind" (1921), "An Outline of Philosophy" (1927), "An Inquiry into Meaning and Truth" (1940), and "Human Knowledge: Its Scope and Limits" (1948). He also wrote books of short stories, "Satan in the Suburbs" (1953) and "Nightmares of Eminent Persons" (1955).

Russell lectured in 1938 at the Univ. of Chicago, and afterwards at the Univ. of California. Receiving in 1940 simultaneous appointments at Harvard Univ. and the Coll. of the City of New York, he intended to accept the latter. He was to teach logic, foundations of mathematics, and philosophy of science (not religion and ethics). Nevertheless his appointment became the subject of public attack on the ground of his alleged radical and anti-Christian views, especially in regard to matters of sex and marriage, and a taxpayer's suit against the Board of Higher Education was successful in obtaining revocation of the appointment. Russell's application to be made a party to the proceedings had been denied, and the corporation counsel refused to appeal the court's decision.

After teaching at the Barnes Foundation, Merion, Pa., 1940-43, Russell returned to England, where he received a fellowship at Trinity Coll. He was awarded the Nobel Prize for literature in 1950.

Russell, SIR CHARLES ARTHUR, jurist, born near Newry, Ireland, in 1832; died Aug. 10, 1900. He was descended from a family of Roman Catholics, four of his brothers entering the service of the church. After studying at Dublin Univ., he turned his attention to law, but in 1851 sought greater possibilities in London. He worked as a reporter on several papers, studying law in the meantime, and was admitted to the bar at Lincoln's Inn in 1859. He became Queen's counsel in 1872, and in 1880 was chosen a member of Parliament. There he supported the Home Rule policy of Gladstone in a masterful and influential way, was knighted in 1886, and in 1894 was made Lord Chief Justice of England as successor to Lord Coleridge. He visited Canada and the U.S. in 1896 and delivered an address before the Bar Assn. of America, at Saratoga Springs, N.Y., on "International Arbitration." He was a persuasive and energetic speaker. He presided over the trial of Leander Starr Jameson, in 1896, and subsequently over other equally noted cases.

Russell, GEORGE WILLIAM, known as *Æ,* poet, essayist, and painter, born at Lurgan, County Armagh, Ireland, Apr. 10, 1867; died at Bournemouth, England, July 17, 1935. He was educated at Rathmines School, Dublin, and also spent some time each year for many years at the Dublin School of Art. An organizer of the Irish Agricultural Organization Society (1897), an agricultural cooperative movement, he later edited its organs, *The Irish Homestead* (1904-23), and *The Irish Statesman* (1923-30). In addition to his efforts for the agricultural cooperative movement, he was active in the fight for Home Rule in Ireland and was a particularly prominent figure in the Irish literary renaissance, being one of the founders of the Abbey Theater. Although he never painted for profit but, instead, gave away his paintings to his friends, he is nonetheless known for his beautiful landscapes, as well as for his mystic, harmonious lyrics. His writings include "Homeward: Songs by the Way" (1894), "The Earth Breath" (1897), "The Divine Vision" (1904), "Voices of the Stones" (1925), and "Song and Its Fountains" (1932), as well as a number of economic treatises, and a tragedy, "Deirdre" (1907).

Russell, JOHN, EARL, statesman, born in London, England, Aug. 18, 1792; died May 28, 1878. He was the third son of John, sixth Duke of Bedford, studied at the Univ. of Edinburgh, and in 1813 was elected a member of Parliament. He attracted much attention by an address in opposition to a union of Sweden and Norway. In 1819 he delivered an address in favor of parliamentary reform, a question in which he took special interest during his entire political career, and in 1830 assisted in framing a reform bill. He became Home Secretary in the second Cabinet of Lord Melbourne, in 1835, and was made Colonial Secretary in 1839, introducing many important bills during the period. When Peel began to agitate against the Corn Laws, Russell opposed him from 1841 to 1845, but in the latter year wrote a much discussed letter in favor of repealing the Corn Laws. Peel resigned in 1846 and Russell formed a new ministry, which remained in office until 1852, when it fell on account of the famine and a rebellion in Ireland. He entered the office of Foreign Secretary under Lord Aberdeen the same year, and in 1855 became Colonial Secretary in the cabinet formed by Lord Palmerston. In 1865, he succeeded to the leadership of the Liberal party, but resigned the following year because his new reform bill failed, and henceforth held no office. An accomplished writer, his principal works include "History of the British Constitution," "Life of Thomas Moore," "Recollections and Suggestions," and "Life and Times."

Russell, LILLIAN (HELEN LOUISE LEONARD), operatic soprano, born at Clinton, Iowa, in 1861; died in 1922. After initial appearances at the age of 16, she sang at the Pastor Theater in New York City, becoming very popular in "The Great Mogul" (1881). Following a season with McCaull's Opera Co., she formed her own company, presenting such favorites as "Polly" (1884-85) and "Wildfire" (1907-08). She was a member of the famous Weber and Fields burlesque group (1899), and sang principally comic opera roles. In 1912, she married her fourth husband, A.P. Moore, and retired from the stage.

Russell, WILLIAM, LORD, statesman, born Sept. 29, 1639; was executed July 1, 1683. After being graduated from Cambridge, he traveled in Europe, and in 1660 became a member of Parliament. He took little part in public debates until 1673, when he became a recognized leader of the Protestants in England, and subsequently was prominent as an opponent of King Charles and the Catholics. In 1680 he joined others in planning to secure a Protestant king of England and, as a means of retaliating, the opposition accused him of being implicated in the Rye-House Plot, but it was afterward learned that he had no knowledge of this or of any plan to raise an insurrection against the king. However, he was arrested on a charge of having plotted against the king and was accordingly condemned to be executed. Many attempts were made to save his life, but, as the king would not yield, Russell himself refused every other means, though an opportunity was given him to escape. His life stands as an example of a Christian martyr. Algernon Sidney, his fellow victim, was executed before the close of the year.

WILLIAM, LORD RUSSELL

Russell, WILLIAM CLARK, novelist, born in New York City, Feb. 24, 1844; died Nov. 8, 1911. His father, an Englishman, was a favorite concert singer in New York and a composer of songs. The son was educated at Winchester, England, and in France. He began sea life as a midshipman in 1857, and made several voyages to Asia and Australia. In 1865 he abandoned the sea and turned his attention to literature, contributing to several London periodicals and writing a few novels under a pen name. His first literary work of merit was a sea tale called "John Holdsworth, Chief Mate." This was followed by other writings of the same character. He served for some time on the staff of the London *Daily Telegraph,* but resigned in 1887. His writings include "What Cheer," "An Ocean Tragedy," "The Frozen Pirate," "A Sea Queen," "The Wreck of the Grosvenor," "The Romance of a Midshipman," "A Book of the Hammock," "The Yarn of Old Harbor Tower."

Russell, SIR WILLIAM HOWARD, journalist, born in Lilyvale, Ireland, Mar. 28, 1820; died Feb. 10, 1907. He studied at Trinity Coll., was admitted to the bar in 1850, and served as correspondent of the London *Times* in the Crimean War. It was Russell who made public the sufferings of the British soldiers in their winter quarters, which caused the British ministry to be succeeded by one pledged to military reform. He corresponded for the London *Times* from the beginning of the mutiny in India, in 1857. The following year he founded the *Army and Navy Gazette,* in which he supported progressive views in military and naval affairs. At the time of the Civil War in the U.S. he corresponded from America, accompanying Gen. McDowell and others. In 1866 he reported the war between Prussia and Austria, and in 1870, between France and Germany. Later he accompanied the British army to South Africa to report the events in the Zulu troubles. He was granted the Iron Cross in Germany, the Legion of Honor in France, and in 1895 was knighted by the queen. Among his numerous writings are "My Diary in India," "Letters from the Crimea," "My Diary North and South," and "Canada: Its Defenses, Conditions and Resources."

Russell Sage Foundation (*rŭs'ĕl sāj foun-dā'shŭn*), established (1907) by Mrs. Russell Sage for the improvement of social living conditions in the U.S. It has an endowment of about $15,000,000. Through studies, the spreading of information, and grants to other agencies, it seeks to aid in the solution of community problems, problems of social work practice, industrial relations, consumer credit, civic improvement, etc. Among its publications are "Technology and Livelihood" by Flédderus and Van Kleeck, "The W.P.A. and Federal Relief Policy" by Howard, etc.

Russia (*rŭsh'à*) (now the Union of Soviet Socialist Republics, which see), an extensive country of Europe and Asia, embracing about one-sixth of the land area of the earth. The Russian Empire, which disintegrated after the Russian Revolution in 1917, included Russia proper, and Finland, Estonia, Latvia, Lithuania, Bessarabia, and part of Poland. The population in 1912 was estimated at 171,095,200. The capital was St. Petersburg (now Leningrad). The total area of the Russian Empire was 8,660,000 sq. m., of which 2,005,616 sq. m. were in Europe.

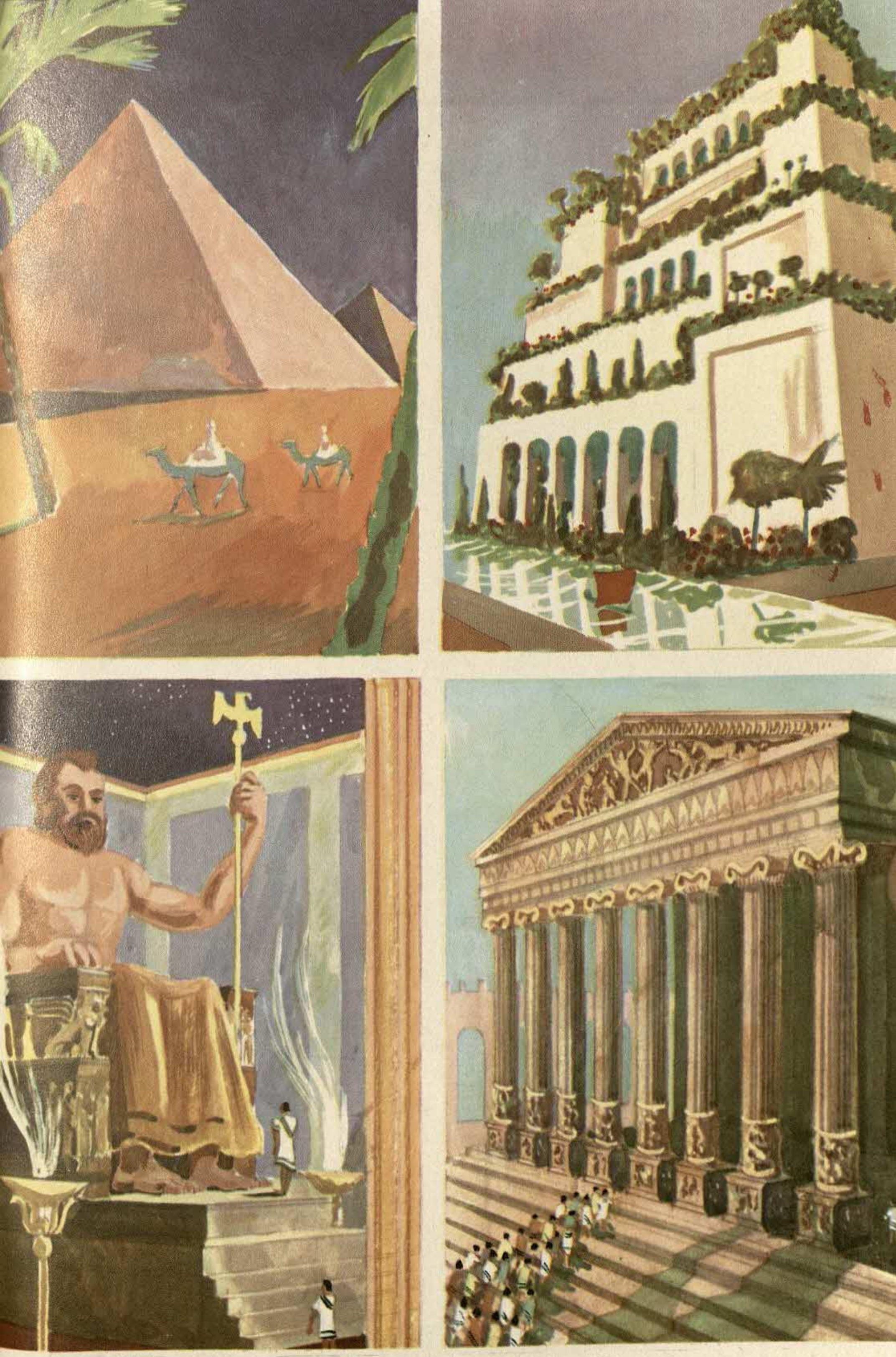
Description. Russia in Europe includes the vast region lying north of the Black Sea and the Caucasus Mts. and east of Finland, Czechoslovakia, Poland, and Rumania. The surface consists chiefly of an immense plain, which is well watered by numerous rivers and many small streams. The Valdai Hills form the only elevated region of the interior. They are situated between Moscow and Leningrad, forming the important interior watershed, though their average height is only 500 ft., and the most elevated peaks are about 1,200 ft. above sea level. On the eastern boundary are ranges of the Ural Mts., which separate Northern Europe from Asia. Between the Caspian and Black Seas extend the Caucasus Mts., which separate the valley of the Terek from that of the Kura, and on the southern shore of the Crimea are the Taurida Mts. Mount Elbruz, 18,570 ft. high, is the most elevated peak of the Caucasus Mts. and of Europe. The highest elevations of the Ural Mts. do not exceed 7,000 ft., and those of the Taurida are not over 4,000 ft.

The inland waters of Russia include a number of valuable lakes, all of which are in the northwestern part, including Lakes Onega, Ladoga, Sego, and many others. The White Sea is the principal coast indentation from the Arctic and the Gulfs of Finland and Riga, from the Baltic. In the southern part is the Sea of Azov, while the Black and Caspian Seas, both on the southern border, are important for supplying navigation facilities. The principal inland waters in Asia, belonging to Russia, include the Aral Sea and the Lakes of Balkash, Baikal, Issyk-kul, and Chany. Most of the drainage in Europe is toward the south. The Volga and Ural Rivers flow into the Caspian Sea; the Don, into the Sea of Azov; and the Bug, Pruth, Dnieper, and Dniester, into the Black Sea. The Baltic Sea receives the waters of the Vistula, Nieman, Duna, Neva, and Narova and the Arctic receives those of the northern Dwina, Onega, Petchora, and Mezen. Asiatic Russia also has a large number of important rivers, many of which are partly frozen the greater portion of the year. Those flowing into the Arctic include the Lena, Indigirka, Yenisei, and Ob. The southeastern part is drained largely by the Amur and the southwestern part, into inland seas, chiefly by the Oxus (Amu) and the Syr-daria.

Climate. The climate is distinctly continental, but it is greatly diversified on account of the immense extent of the empire. The winters are colder and the summers are hotter than in the same latitudes of the countries in Europe, but the annual temperature is somewhat higher in the west than in the east. This is due to the fact that the east has a higher elevation above sea level and is influenced noticeably by the Pacific Ocean. In the southern part the climate is favorable to the growth of sugar cane, the vine, and other fruits, but there is a gradual decrease in vegetable forms toward the north until the Arctic region is reached, where only slight traces of lichen and mosses prevail. Winds sweep across the country from the north and the south, owing to the absence of mountain barriers, and changes in temperature are quite sudden and violent.

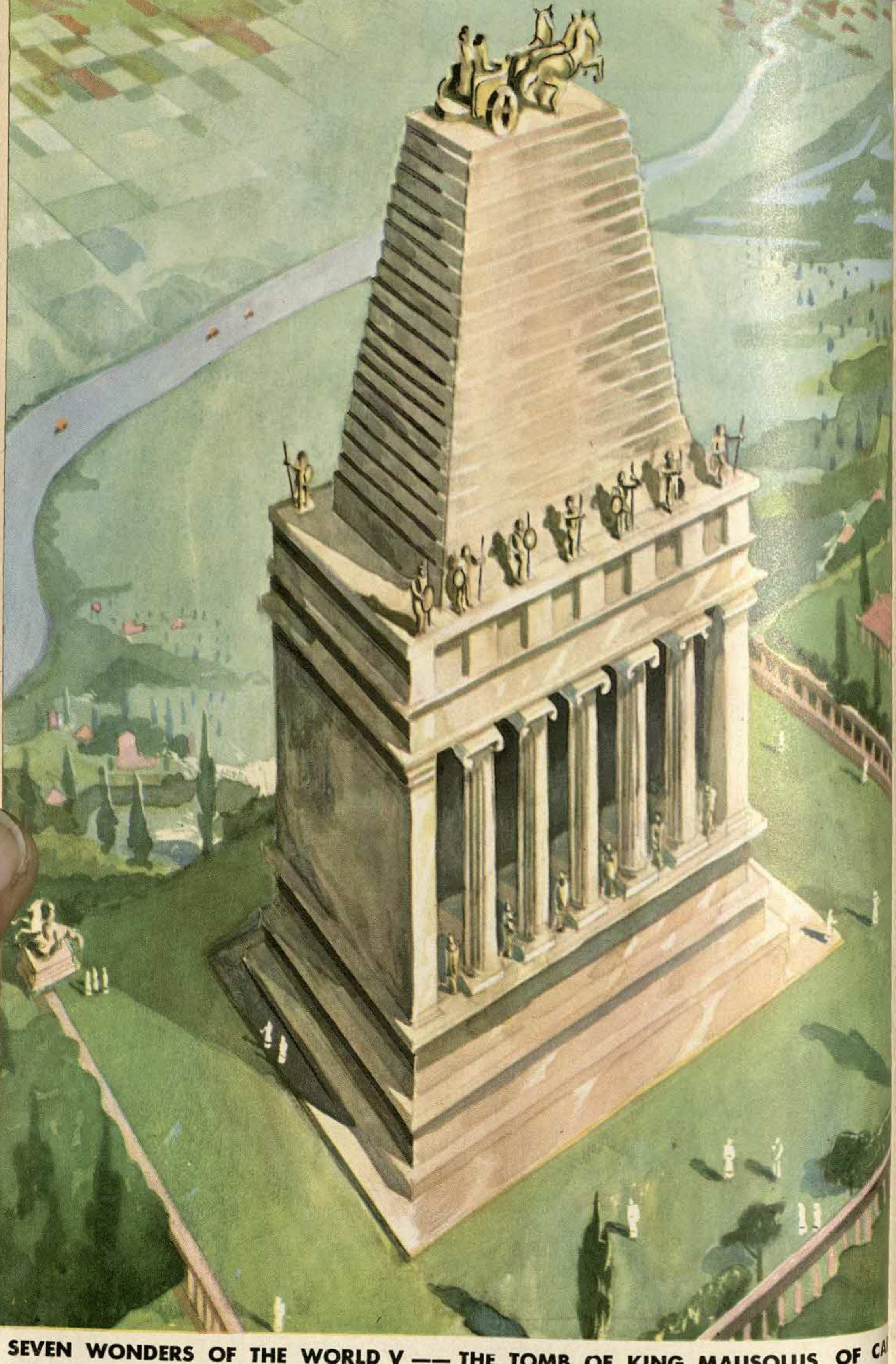
At Leningrad the mean temperature is 15° in January and 65° in July, but in the southern part, adjacent to the Caspian Sea, the summers are very hot, with extremes of 96° to 110°. Astrakhan and the country surrounding the Aral Sea have a very slight rainfall, ranging from 4 to 10 in. per year, but it increases toward the northwest, being about 22 in. at Leningrad. The rainfall in the entire country is given at 20 in. Snow falls in all parts of Russia, but remains only a short time in the southern part, while the northern section has localities that are covered with snow perpetually. In general the climate is healthful and bracing, well calculated to support a hardy and vigorous people.

Flora and Fauna. Few regions of equal extent have a more fertile soil than is found in the Russian possessions, but the country has vast sandy tracts, morasses, and swamps. The greater part of the unproductive surface is in the vicinity of the Caspian and Aral Seas, owing to the arid climate and the presence of large deserts or sandy



SEVEN WONDERS OF THE WORLD

I THE PYRAMID OF CHEOPS II THE HANGING GARDENS OF BABYLON
III THE STATUE OF JUPITER AT OLYMPIA IV THE TEMPLE OF DIANA



SEVEN WONDERS OF THE WORLD V —— THE TOMB OF KING MAUSOLUS OF CA wastes. Swamps of considerable extent abound north of Leningrad, and unproductive regions stretch through the country between the Ob River and the Ural Mts. However, a large part of both European and Asiatic Russia consists of a rich, black loam of great fertility. The forests are boundless and extend far toward the north, but the size of the trees gradually diminishes toward the Arctic seas, where only small shrubs are found in isolated tracts. More than half of the country is still covered with timber, including the birch, larch, fir, alder, oak, hornbeam, maple, ash, and conifers.

In the northern section are many wild animals of large size, such as the polar bear, elk, and deer. Other animals include the wolf, lynx, wild boar, glutton, and wild fowl. The beaver is found in large numbers in Byelorussia near Minsk. Foxes, squirrels, partridges, and hazel hens are numerous in the central part. Cod and salmon are found in large numbers off the northwestern coast. Seals are prolific in the Arctic. Herring, sturgeon, and other valuable fishes are taken in large numbers from the seas, lakes, and rivers. Bird life is well represented in the southern and central parts; but is scant along the coasts of the Arctic.

INHABITANTS. Slavs form 78 per cent of the total population, Turkish tribes ranking second in importance. Occupying central European Russia are the Great Russians or Muscovites. Little Russia is largely populated with Ukrainians or Ruthenians, and the Cossacks. In the west are the White Russians.

For natural resources, manufactures, industry, education, religion, communications, government, etc., see *Union of Soviet Socialist Republics.*

LANGUAGE. The Russian language is an important member of the Slavonian family of the Indo-European tongues and is the successor of the Old Slavic. It was modified remarkably by the Mongolian conquest, in 1224, and by Polish elements introduced from the West. Modern Russia may be said to date from the time of Peter the Great, but since then many German, Dutch, and French words have been added and the grammatical construction has been modified. The language contains few conjunctions. It is peculiar for the slight grammatical connection between the sentences, but has a remarkable capacity for forming derivatives and compounds. Its alphabet has 37 letters, which form combinations and sounds difficult for foreign students to learn. Under the Soviet Union, the Russian alphabet has undergone simplification, the number of letters being reduced. The language is spoken in its purest and most grammatical form in Great Russia, of which Moscow is the literary and intellectual center. Considering the extent of the Soviet Union, pronunciation and word usage in the Russian language is astonishingly uniform. There are two principal dialectic divisions, the northern and southern groups. The Moscow dialect, basis of the language used in literature, is confined to a small area.

LITERATURE. Russian literature may be said to date from the introduction of Christianity by Vladimir in 980. It was in his reign that the first ballads in Russian were written. At that time knowledge began to be disseminated by the monasteries, at which were published numerous treatises on beliefs of the church and a number of historical works. The first writing of note in the Russian is a book of the Gospels that appeared in 1056, but the military contests with the Tartars and Mongols long retarded material literary advancement. The spirit of military adventure gave rise to what was later known as the national ballad of the 12th century, "The Story of Igor." This prose epic relates the struggle of Igor, prince of Novgorod-Severskiy, against the Polovtzes. It was handed down from generation to generation, often being changed and often being completely revised to fit new situations. In 1560, Makarius published his "Lives of the Saints," the first writing of note after the expulsion of the Mongols and Tartars, and in 1596 appeared Zizania's "Slavic Grammar." Alexei Michailovitch authorized his prime minister to collect Russian laws, which were printed in 1644, and soon after an academy was founded at Moscow. Peter the Great established the Russian language for universal use in public business and communication and founded many schools, among them the famous St. Petersburg Acad. The writers of the early part of the 18th century were influenced greatly by German and French authors, the most eminent writer of this period being Lomonosov (1711-65). Gerhardt F. Müller, a German writer, established the first literary journal at St. Petersburg, in 1755, and Novikov (1744-1818) published a journal called *The Painter,* through which medium he greatly enlarged the book trade.

Literature became popular in all parts of Russia in the reign of Alexander I, who was a liberal patron of progressive education and greatly increased the number of universities. Since that time Russian literature in all departments has been enriched by the contributions of native writers as well as by liberal translations from other languages. The most eminent poets of Russia include Alexander Pushkin, Michael Lermontoff, and Baron Delvig; the novelists embrace Feodor Michailovitch, Prince Odojevski, Nikolai Gogol, Feodor Dostoyevski, Dmitri Merezhkovski, Ivan Turgenieff, Maxim Gorki, and Count Leo Tolstoy; the dramatists include Anton Chekhov, Nikolaus Polevoi, Aleksandr Ostrovski, and Nestor Kukolnik; and the historians embrace Nikolai Karamzin, Michailovoski Danieleveski, Vasili Berg, and

Professor Mikhail Pogodin. Russian philosophy was drawn principally from German and English sources, but the country has some eminent writers in jurisprudence and philosophy, the former including Simonof and the latter Sokolof. For literature of the Union of Soviet Socialist Republics, see under that heading.

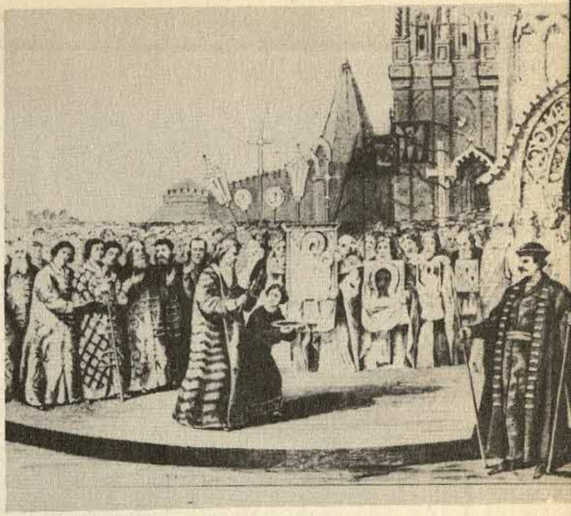
Art. Russian art did not show any signs of development from the 10th century to the 19th. The Russians repeated strictly conservatively the schemes of Byzantine art (*q.v.*) and painted in this style primarily icons, that is, religious panels. Sometimes the painting itself was covered with a shield of metal and precious stones, leaving space open for painted faces of the Virgin and Child. In the 19th century, especially during its second half, Western influences became apparent. Some artists, like Vereshchagin and Repine, followed the general trends of the century elsewhere in Europe. Works reflecting Western European taste, especially of the 18th century, can be found at some castles and palaces in Russia. They were, however, always executed by Western European artists who had been called to Russia by the Czars, from the time of Peter I.

History. The early history of Russia is wrapped in myth and tradition. Nothing definite is known before the 9th century of the Christian era. No country in the world has so great a variety of nationalities, but the chief one is the Slavonic. It is thought that eastern Slavs were the ancestors of the Russians. They settled on the northern shore of the Black Sea in the early part of the Christian era, but, being harassed continually by neighboring tribes, they invited Rurik, a Scandinavian, to come and reign over them. It appears that he and two brothers established a government in 862, in the vicinity of Kiev. The name *Russes* appears to have been originally applied to Scandinavians who settled on the Dnieper. Olga succeeded to the government in 945 and in 955 she embraced the Christian religion under the patriarch of Constantinople, but in 957 abdicated in favor of her son, Sviatoslaf. The government passed to Vladimir in 980. In the 35 years of his reign he established Greek Christianity as the religion, founded cities and schools, and built a number of canals and other improvements. At that time Kiev rose as a city quite equal in importance to Constantinople. His reign is considered the heroic era of Russian history.

Vladimir was succeeded by his sons, who established a number of principalities, making it possible for the Mongols and Tartars to invade the country under Genghis Khan in 1224 and inflict material damage to its prosperity. Soon the Russian princes became tributary to the Khan, placing Russia in an unfortunate condition. Its civilization and industries became retarded, placing Russia culturally 200 years behind the other European nations. In addition, the country assimilated oriental customs, removing her further from western Europe. This condition caused the Poles and Teutonic Knights to make invasions from the west, but both Kiev and Novgorod continued to gain in commercial importance and power. Novgorod, being an influential city, was the capital during a large part of that period and was an important member of the Hanseatic League. The capital was removed to Moscow in 1328 by Ivan I, originator of the centralized administrative system which prevailed until the reign of Peter the Great. In 1480, the Tartars were expelled by Ivan III, surnamed the Great, who ruled from 1462-1505. He married the niece of the last Byzantine emperor, conquered Novgorod, and otherwise extended Russian dominion. Ivan IV, surnamed the Terrible, succeeded to the throne in 1553 and reigned 51 years. His armies were everywhere victorious and, after consolidating Russian territory, he became absolute ruler with the title of *czar*. He began the conquest of Siberia, which was finally annexed to Russia in 1699. His son, Feodor, was the last ruler of the house of Rurik. In 1613, the Romanov dynasty was founded which reigned until 1917.

Alexis Michailovitch succeeded to the Russian throne in 1645, reigning until 1676. He succeeded in wresting Little Russia and White Russia from the Poles. In the meantime the Cossacks of the Ukraine were compelled to recognize Russian supremacy, but the country was disturbed by contentions over changes made in the liturgy of the Greek Church. However, Russia's greatness may be said to date from the accession to power of Peter the Great in 1689. His reign of 36 years was at first shared by his half-brother, Ivan, but he soon obtained absolute sway, made St. Petersburg the new capital, and gave Russia a European rather than a Mongolian tendency. His achievements include the final conquest of Siberia. He annexed Livonia, Ingria, Estonia, and other territory taken from Sweden by the Peace of Nystadt, in 1721, and constructed canals, encouraged agriculture, and instituted manufacturing and mining. He was succeeded by his widow, Catherine I, in 1725, but she died after a reign of two years and was succeeded by Peter II. The latter was succeeded in 1730 by Queen Anna, the daughter of Ivan, and in her reign the German party became prominent at court. Elizabeth Petrovna, daughter of Peter the Great, reigned from 1741-62. She was successful in battle against Prussia and continued her father's westernization process. Her son, Peter III, was dethroned in the year of his accession by his wife, a princess of Anhalt-Zerbst, who became Catherine II (the Great). During her reign (1762-96), Russia conducted successful wars against Sweden, Turkey, Persia, and Poland. The contests resulted in material extensions toward the east, south, and west. This accession of territory was due chiefly to the three partitions of Poland, in 1772, 1793, and 1795, by which nearly two-thirds of that kingdom became incorporated with Russia, and the annexation of the Crimea in 1783. Under Catherine, too, western civilization gained a further foothold in Russia, commerce and industry flourished, and schools and charitable institutions were founded.

Freedom of worship gained a wide foothold under Paul I (1796-1801), but he greatly retarded the progress of learning by excluding foreign publications and establishing a strict press censorship. Paul, who battled an antagonistic aristocracy for the duration of his reign, was assassinated by conspirators. His successor, Alexander I (1801-25), brought to his reign the 18th century ideal of humanitarianism. One of his first acts was to issue a manifesto proclaiming the right of individuals of all classes, except serfs, to own land, a direct blow at the privileged nobility. In 1803, he decreed that serfs might be freed with land, at the discretion, however, of the estate-owners. Although professedly against war, Alexander, reigning in the period of the Napoleonic wars, led Russia through many campaigns and effected far-reaching changes in her borders. A meeting between Alexander and Napoleon at Tilsit resulted in an agreement between the two rulers in accordance with which Alexander fell in with Napoleon's plans, receiving in return a promise of noninterference in Sweden and Turkey. Finland and the Aland Islands were thereupon wrested from the former in 1809, and the territory lying between the Dniester and the Pruth was ceded by Turkey in 1812, after six years of war. The accord with France foundered, however, and in 1812 Napoleon launched his ill-fated invasion of Russian soil. Alexander played a leading role in bringing about Napoleon's ultimate defeat and was prominent in the peace negotiations which followed. The newly established kingdom of Poland came under Russian suzerainty by the terms of the Congress of Vienna. Alexander had also, in the meantime, begun the subjugation of the Caucasus, bringing Georgia under Russian rule



Courtesy Bettmann Archive, N. Y.

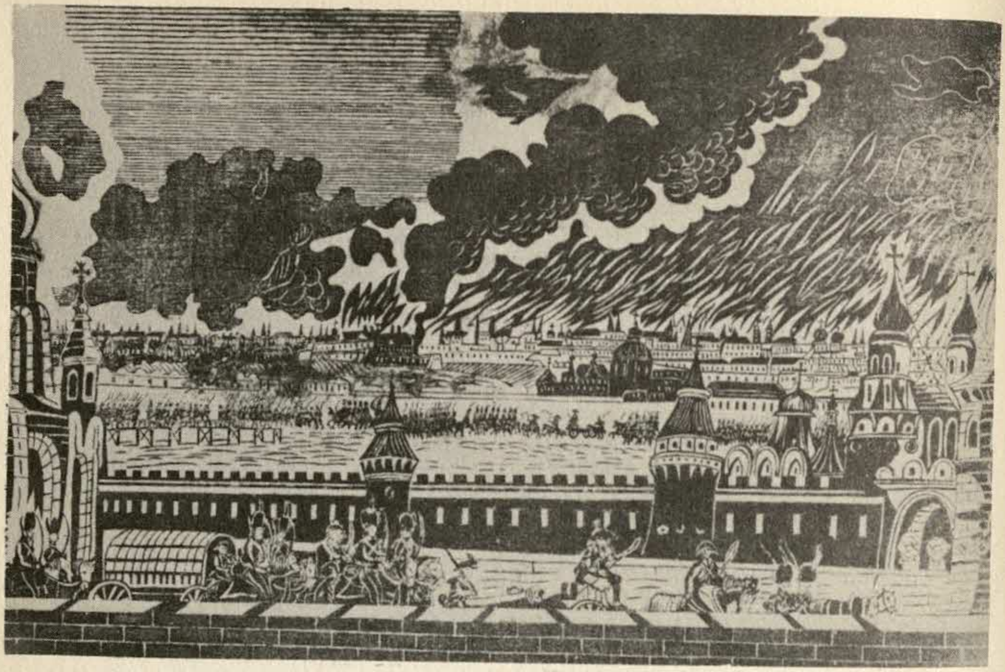
Courtesy Bettmann Archive, N. Y.

FOUNDING OF THE ROMANOV DYNASTY, 1613
(top)

SMOLNIY MONASTERY, LENINGRAD
(center)

This 18th century structure shows a charming mixture of late baroque style with onion-shaped towers typical of Russian architecture

RUSSIAN PEASANT OF THE 18th CENTURY
(bottom)



MOSCOW AFLAME, 1812

The capital was purposely set afire by the defenders when Napoleon marched into the city. This ingenious strategy robbed the French forces of shelter and food and marked the beginning of Napoleon's final defeat

(1801) and had acquired Daghestan, Baku, and Shirvan from Persia (1813). Alexander's heir and brother, Constantine, renounced his title to the throne, and it was Nicholas, a younger brother, who succeeded Alexander I in 1825. Liberal nobles, however, rose in rebellion on behalf of Constantine and the revolt which followed became known as the rising of the Decembrists (the rebellion occurred in December 1825). It was soon put down and its ringleaders were punished, though the first blow at reactionary rule had been struck. Nicholas waged war successfully against Persia, adding Armenia to Russia's spoils (1828). The tribes of the Caucasus were brought further under Russian rule by the successful conclusion (1829) of a campaign directed against Turkey, and Moldavia and Wallachia were established as protectorates of the czar. Turkey was also forced to recognize the independence of Greece, which had been virtually secured by the victory over the Turkish fleet at Navarino (1827), in which Russia had played a major part.

Although success attended his moves in the south, Nicholas was forced to deal with insurrection in Poland. Polish patriots rose in revolt in 1830, expelling the Grand Duke Constantine and establishing a provisional government. They fought stubbornly against the empire's overwhelming might, but were finally forced to capitulate, Warsaw falling in September 1831. Nicholas was compelled, however, to make concessions and a statute was promulgated according to which Poland was to be treated as a conquered state, instead of being incorporated into Russia. A campaign to bring all of the Caucasus under Russian suzerainty was now launched (1834), a campaign which was to occupy nearly half a century.

An ill-advised attack on Turkey (1853) very nearly wiped out all of Russia's gains from that country. Turkey was aided by France, England, and Sardinia, and the sanguinary Crimean War ensued. Nicholas' death in 1855 preceded by six months the fall of Sevastopol. By the Treaty of Paris (1856), Russia lost part of Bessarabia and her protectorate over the Danubian principalities and was forced to accept neutralization of the Black Sea.

Alexander II (1855-81), the son of Nicholas I, followed in the first Alexander's liberal footsteps. He did away with corporal punishment and the farming of taxes. In 1861, he abolished serfdom, thus creating 20,000,000 freemen who were aided by government loans in setting themselves up as independent farmers. He also brought about important judicial reforms. Revolutionary agitation in the empire had been increasing, however, notably among the Nihilists (*q.v.*), and Alexander renounced his earlier liberalism for reactionary rule. A Polish revolt of 1863 was summarily dealt with and within the next few years, Poland was gradually incorporated into the empire.

Under Alexander, Russia made great territorial gains. China ceded Amur to Russia in 1858, and the Caucasus was subdued by 1864. Alexander completed the subjugation of central Asia, begun under Peter the Great over a century before. Samarkand came under the Russian aegis (1868), and Bokhara became a vassal state in the same year. The Transcaspian region was fully conquered by 1881. Russia's Black Sea status had long been a bone of contention and, in 1870, when Napoleon III of France was overthrown, Alexander made it clear that Russia no longer felt herself bound to recognize the neutrality of the Black Sea. The London Conference of 1871 acceded to this claim, a fact which led the way to further Russian aggression against Turkey. Seizing Turkey's treatment of her Christian subjects and of the subject Bulgarians as an excuse, Russia again went to war against the Ottoman Empire in 1877. Suffering decisive setbacks at first, Russian forces began an intensive campaign toward Constantinople in January 1878, forcing the Turkish army to capitulate before it reached the city. The two nations then concluded the Treaty of San Stefano, by which Russia gained large advantages. However, fear that Russia might soon dominate all of the Middle East led to the calling of the Congress of Berlin in 1878 (see *Berlin, Treaty of*). In the meantime, Russia had relinquished Arctic territory, selling Alaska (*q.v.*) to the U.S. in 1867.

Unrest among the people, brought about by Alexander's reversion to arbitrary rule, was steadily mounting. The secret police were abolished as a sop to the public and, to a certain degree, the czar returned to his earlier tenets. Not sufficiently, however, to appease the agitators and Alexander was assassinated while journeying to St. Petersburg in March 1881. His son, Alexander III (1881-94), epitomized the reaction brought about by the czar's murder. He established a regime based upon autocratic principles and governed rigidly. Though he followed a pacific policy in the west, he continued to pursue the Russian course of conquest in the east. Difficulties arose with England which threatened to lead to war, but were settled in 1885, with the appointment of a joint commission to adjust the Afghan boundary. Important events of his reign include the completion of the Trans-Siberian R.R., severe persecution of the Jews, and the famine of 1890-91. In the field of foreign affairs, he concluded an agreement with France to balance the power of the Triple Alliance of Germany, Italy, and Austria-Hungary, which ultimately led to the Entente Cordiale (Russia, France, England).

Succeeding Alexander III was Nicholas II, who ascended the throne in 1894. Nicholas gained advantages and privileges for Russia in the Far East. In the field of European politics, he called an international peace conference at The Hague, The Netherlands, in 1899, in order to discuss ways and means of maintaining peace. More important, however, was the situation at home. To stem the rising revolutionary tide, efforts were made to ease the lot of the workers and peasants, but they were of no avail. Repressed in 1896 and 1905, the workers and peasants triumphed in 1917, helped by the social chaos arising out of World War I.

Before 1905, the history of Russia had been a succession of liberal advances and revolutionary setbacks. The revolutionaries, led by the more enlightened workers, the university students, and radical intellectuals, fought with education, with literature, with mass demonstrations, and with outright terror against the domination of the corrupt aristocracy. The background for such social reform may be found in the writings of Bakunin and Herzen. The ruling classes, in turn, fought with censorship of all printed matter, with sentences of exile or death for the ringleaders, with police spies, with armed opposition. Sometimes this dominant class appeared to yield (as in the liberation of the serfs in 1861), but though laws of reform were placed on the statute books, no official wrath fell on the landed gentry who refused to carry them out. In 1904, Russia, feared by Japan for her advances in the Far East and especially in Manchuria, became involved in a disastrous war with Japan (see *Russo-Japanese War*). Her military and defense preparations had not kept pace with her belligerent diplomacy, and her army and navy suffered defeat after defeat. Popular feeling against the government held responsible for this humiliation of national pride ran very high. In 1905, a delegation of workers, and women and children, led by the priest, Father Gapon, marched to the Winter Palace at St. Petersburg (now Leningrad), to speak to the czar in the hope that he would yield to their request for "regular popular representation." The czar was absent, and the palace troops opened fire on the unarmed crowd, killing over a thousand. Besieged by reactionary advice, and fearful of further demonstrations, Nicholas II wavered. He first promised the landed proprietors that no concessions would be made, and then allowed the head of the government, Bulighin, to promise a "Duma" which would allow its members to draft laws which would not take effect unless approved by the council of state. When the nature of this program became known, all hope that the czar would be able to compose the class difficulties disappeared. Workmen struck, students stayed home from classes, numbers of the peasants rose and murdered the farm agents of the nobles, and by Oct. 10, a general strike ended all commerce, communications, and transport in Russia. Before this formidable power Nicholas again appeared to yield, declaring that "no law was to be enacted without the consent of the Duma." At the same time Jewish pogroms and extremist riots were engineered by police agents to convince the czar that police power was indispensable to his maintenance and to divert the public eye from revolutionary activities. A Soviet (council) of workers' delegates, led by Trotsky and backed by Lenin, attempted to function as a government in defiance of the regularly appointed ministry of Count Witte. Early in December this Soviet was arrested and imprisoned. During the next week its successors attempted to seize St. Petersburg by force but the arrival of the local garrison quelled the disturbance. Though ruthless repression measures were carried out against the rank and file, the czar was still fearful enough of further insurrection to refrain from executing the leaders, and exiled them from the country. The intervening period between 1905-17 was a time of widespread depression among the people, but the ensuing events served to harden their determination that the next attempt at overthrow would be successful. Though the Duma duly met, it was several times arbitrarily prorogued by the czar and its meeting place was closed and surrounded by soldiers. The two ruling-class groups, the liberal representatives of the new industrialists and businessmen who favored a step forward in the direction of a capitalistic democracy, and the old reactionary, tradition-loving landowners who resisted all change, jockeyed for a working majority which neither side ever obtained. Completely dominated by the monk Rasputin, and by the czarina, Nicholas blindly pursued the path to disaster.

Upon the outbreak of war in 1914, a current of patriotic loyalty ran in favor of the czar, who announced that he was going to take his place in the field with his troops. World War I was in a sense precipitated by Russia when, fearing for her Balkan interests, she refused to permit the invasion of Serbia by Austria-Hungary following the assassination of Archduke Ferdinand, June 28, 1914, at Sarajevo. Russian troops were mobilized and, on Aug. 1, Germany, allied to Austria, declared war on Russia, Austria-Hungary following suit on Aug. 6. Russia was aligned on the side of the Allies: England, France, Belgium, etc. The loyalty shown the czar at the outbreak of the war was felt necessary to maintain a national cohesion, so important to the successful prosecution of the war. But by 1915, this early patriotism, faced with the inefficiency and incompetency of autocratic control, began to give way to contempt. Troops were recruited and equipped, and then allowed to molder in idleness in city garrisons because the bureau responsible for transportation could not provide enough trains to carry them to the front. The cost of living mounted. The war revealed with glaring clarity that, presented with any critical problem, the government system would break down. In March 1917 spontaneous riots broke out in Petrograd; more than 80,000 workmen went on strike. Red flags and incendiary placards made their appearance, exhorting the people to withdraw from the war. The discipline of the Petrograd (formerly St. Petersburg, renamed 1914; later again renamed Leningrad) garrison had been so shaken by evidences of the blundering and corruption of its officers that when the order was given to fire on the mob, the soldiers refused to obey. The strikers formed themselves into Soviets of workers and soldiers, and organized an agitation which spread the spirit of rebellion everywhere. Four days after the first riots, Petrograd was in their hands. During these first days, two separate organizations shared control, the temporary executive committee of the Soviets, and a temporary governing committee representing the Duma. An army dispatched by the czar to recapture the city went over to the revolutionists. Nicholas, realizing the futility of further resistance, abdicated on Mar. 14, 1917. A provisional government was formed under Kerensky (*q.v.*), which announced its intention of continuing the war and which was recognized by foreign powers. It was largely composed of the liberal middle-class elements of the Duma faction, and was mainly representative of the capitalist and professional classes. But the problems it had inherited were no longer soluble by halfway measures. The people had been repressed and detoured too long and too often. Instead of vague democratic rights, they wanted such immediate and tangible benefits as the division of the land among the peasantry, the expulsion of the capitalists, and the control of industry by some form of workers' socialism. They soon discovered that the provisional government had no intention of going so far, and dissatisfied groups, led by the Social Revolutionaries and Mensheviks (*q.v.*), formed knots of opposition everywhere. Leadership came in the person of Nicholas Lenin, who returned from exile in 1917. A professional revolutionary, a brilliant speaker and political tactician, Lenin was able to gather around him a body of men, compose their differences, and unite them behind a more or less concrete program. This Bolshevik (*q.v.*) program (the Bolsheviks and Mensheviks can best be distinguished by the fact that the former advocated revolutionary, the latter evolutionary methods of attaining a similar goal) promised (1) immediate peace; (2) immediate and direct distribution of land among the peasants; (3) ownership and operation of factories by the workmen; (4) national control of production and distribution; (5) all power to the Soviets; and (6) the exclusion of the propertied classes from political rights. By ceaseless agitation, speeches, meetings, and personal influence the Bolsheviks maintained tremendous popular support behind this program until the decisive moment. In November 1917, in the name of protecting the All-Russian Congress of Soviets and the Constituent Assembly from armed attacks by forces of the extreme right, Lenin occupied all public buildings, telegraph and telephone offices, bridges, power plants, and the Bank of Russia with soldiers loyal to the Bolsheviks. The Revolution had reached the proletarian stage.

All counter-revolutionary sentiment in Petrograd was eradicated. Troops ordered out by Kerensky, the deposed provisional prime minister, were routed at Tsarkoye Selo, many of them deserting to the cause of the revolutionaries. In March 1918, the Treaty of Brest-Litovsk was signed between Russia and the Central Powers, ending Russian participation in World War I. Russia lost Finland, Poland, Estonia, Latvia, Lithuania, the Ukraine, Bessarabia, and part of Transylvania.

Hostilities concluded with the Central Powers, the Russian Revolution now had to battle for its existence against expeditionary forces sent by foreign nations, who were fearful of the results now that Germany was freed of her eastern front. France seized Odessa, British forces captured the Transcaucasian republics, and American troops landed in Vladivostok in the Far East to aid in the subjugation of Siberia. Anti-Bolshevist adherents poured into these strongholds and by 1919 White (czarist) armies had been formed and were preparing to advance from four fronts (Siberia, South Russia, Petrograd, and Archangel). Denikin held the Ukraine in the south and Adm. Kolchak became head of a separate Siberian government in the east. Czech forces were aiding the anti-Bolshevists in Siberia. About Murmansk and Archangel, where Allied expeditionary forces had also landed, a "North Russian Provisional Government" was set up. Fearing the advance of the White armies, officials in Ekaterinburg, where the czar and his family were held prisoner, executed the royal family, July 18, 1918.

Kolchak's Far Eastern forces suffered defeat at the hands of the Red Army, which then turned against Denikin in the south. Denikin, routed, resigned his command and was succeeded by Gen. Wrangel. But the Bolsheviks had been successful on every front save in the Crimea where Gen. Wrangel had entrenched himself. There was a pause in hostilities and Wrangel attempted, unsuccessfully, to win over the peasantry by offering agrarian reforms. The Red Army, occupied by the start of a war with Poland, literally ignored these last remnants of the White armies. To add to his discomfiture, Wrangel was unaided by Allied troops, for foreign forces had been completely withdrawn from Russian soil by early 1920.

Courtesy Ewing Galloway, N. Y.

VIEW OF THE CAUCASUS MOUNTAINS

With Mt. Kazbek in the background

Poland, determined to push her eastern frontier as deep into Russia as possible, advanced against the Bolsheviks. Incensed by this "foreign invasion" (the same slogan which had been raised to rally resistance against the White armies), the Red Army drove west in a mighty offensive which pushed the Poles back almost to Warsaw. French forces now came to the aid of Poland and the Russians were driven back almost to Minsk where, on Oct. 12, 1920, a truce was arranged. The Treaty of Riga (Mar. 18, 1921) conclusively ended hostilities, but the terms were harsh against Russia. The eastern frontier was set at a point so far east that many Ukrainians and White Russians were brought under Polish rule.

The war with Poland over, the Red Army proceeded against Wrangel and by November 1920 the country was also cleared of anti-Bolshevik elements.

The Baltic states and Finland had followed Poland's example in seeking independence from centuries of Russian rule. Campaigns in that sector were concluded by treaties in which Russia recognized the independence of Lithuania, Latvia, Estonia, and Finland. (Many German soldiers who had helped effect this liberation settled where they had fought, thus producing there a German element which was later to create a mutual sympathy between, *e.g.*, Germany and Finland.)

Stripped now of her border states and torn with dissension in the Far-Eastern regions and in the south, the Russia actually under Bolshevik rule (the Russian Soviet Federated Socialist Republic, formed in 1918 as a "free Socialist society of the working people of Russia") was smaller than the Russia over which Peter the Great had begun his reign. Soviet states had also been formed in Armenia, Azerbaijan, Georgia, etc., and the R.S.F.S.R. took steps to negotiate treaties with these states. A closer union was sought on the basis of the treaty ties, and in 1922 the Union of Soviet Socialist Republics (which see for further developments) was formed, and a constitution promulgated in July 1923.

Russian Orthodox Church (*rŭsh′ạn ôr′thô-dŏks chûrch*). See *Holy Orthodox Eastern Catholic Apostolic Church.*

Russian Revolution (*rŭsh′ạn rĕv-ô-lū′-shŭn*). See *Russia.*

Russian Satellites (*rŭsh′ạn săt′ẹ-līts*), the name applied to those states of Eastern Europe which fell under Russian (or Communist) influence after World War II. These include Albania, Bulgaria, Czechoslovakia, Hungary, and Rumania (*qq.v.*); Yugoslavia (*q.v.*) was once a satellite, but broke away from Soviet domination. The Soviet Union jealously guards these "buffer states" as a vital defense zone between Russia and the Western powers by keeping them behind the so-called Iron Curtain.

Russian Soviet Federated Socialist Republic (R.S.F.S.R.) (*rŭsh′ạn sō-vĭ-ĕt′ fĕd′ẽr-āt-ẹd sō′shạl-ĭst rê-pŭb′lĭk*), largest of the constituent republics composing the Union of Soviet Socialist Republics (U.S.S.R.), extending across Europe and Asia. It occupies the entire eastern half of Soviet Asia, and the northern and central portions of the U.S.S.R. in Europe and in Western Asia, totaling 6,372,860 sq. m., or about 75 per cent of the entire area of the U.S.S.R. Its population of 109,279,000 is more than half of the total population of the Soviet Union and consists of over 100 nationalities. The capital, also capital of the U.S.S.R., is Moscow. The R.S.F.S.R. includes 15 autonomous republics, six autonomous regions, and 10 national districts

Moscow is the base for the principal airlines of the U.S.S.R. One of these, the Moscow-Vladivostok, is the longest national land line in the world. The R.S.F.S.R. is also served by more than 34,000 m. of railroads. Sea transport consolidates communication along the Arctic seacoast, and rivers and canals unite the Baltic, White, and Barents Seas in the north with each other and with the Caspian, Azov, and Black Seas in the south. The rivers include the Volga, Ob, Don, Yenisei, Lena, and Amur.

Before World War II, the R.S.F.S.R. produced a large part of the food and grain crops of the U.S.S.R. In the central part of the country lie the extensive grain lands, where flax, potatoes, and vegetables are also grown. In the south the famous black soils grow wheat, sunflowers (cultivated for their oil), sugar beets, and other crops. The Crimea and the North Caucasus grow rice, cotton, wine grapes, and tobacco.

Natural resources include the world's largest timberlands and 90 per cent of the total coal deposits of the Soviet Union. The coal beds of Kuznetsk in Siberia alone total about 450,000,000,000 tons. The R.S.F.S.R. has half of the world's known resources of iron ore and 80 per cent of those of the U.S.S.R. Copper, tin, zinc, nickel, gold, platinum, petroleum, and water power are abundant.

The R.S.F.S.R. accounted for three-fourths of the industrial output of the U.S.S.R. before World War II. Important manufactures included autos, tractors, airplanes, and agricultural machinery.

Education is compulsory. More than 35,000,000 children attend the elementary and secondary schools and there are about 650,000 students in the universities and technical colleges.

For the part played by the R.S.F.S.R. in World War II, see *Union of Soviet Socialist Republics.*

Russian Thistle (*rŭsh′ạn thĭs′′l*), a plant common to the central part of the U.S., found chiefly in the arid region lying between the Mississippi and the Rocky Mts. Locally it is known as *saltwort* and *tumbleweed*. It thrives best in comparatively dry seasons, has a central stock with many branches, and bears small flowers of a purple color. At maturity the roots loosen and the dry plant is rolled or tumbled by the wind, causing its small seeds to scatter broadcast. In some of the states, especially in South Dakota and Nebraska, it is quite troublesome as a weed in cornfields.

Russo-Japanese War (*rŭs′ô-jăp-ạn-ēz′ wạr*), the contest between Russia and Japan in 1904-05. Ever since 1895, Russia and Japan had been at swords' points as a result of Russia's expansion into Port Arthur and the Liaotung Peninsula. While Japan prepared for what seemed an inevitable attack, Russian defenses failed to keep pace with her belligerent diplomacy. Russia, in 1902, agreed to evacuate certain ports in Manchuria and to aid in re-establishing Chinese authority there, but when, in 1903, she failed to keep this promise, diplomacy failed. The result was a surprise Japanese attack upon Russian ships in

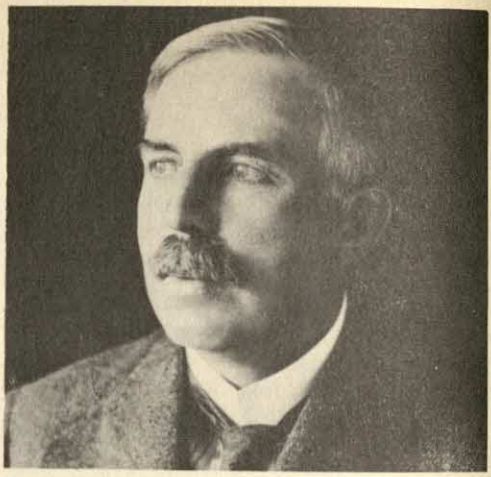
Port Arthur, on Feb. 8, 1904. Warfare continued for more than a year, with Russia consistently meeting defeat. During the war Russia had 870,000 men in the field and Japan had not less than 1,200,000. The Russian losses are given at 312,412, and the Japanese at 210,000. Through the mediation of U.S. President Theodore Roosevelt a peace treaty between the two nations was drawn up at Portsmouth, N.H., and the final agreement was signed on Sept. 5, 1905. Under the terms of the treaty the southern half of Sakhalin Island was awarded to Japan; Russia relinquished to China all of Manchuria; the Liao-Tung Peninsula, including Dalny and Port Arthur, was transferred to Japan, and Japan's "political, military, and economic" rights to Korea were recognized.

Rust (*rŭst*), in botany, a reddish fungus which attacks plants. Some of these parasitic fungi require different hosts during the course of their existence. Apple cedar rust or orange rust which damages apple crops is a fungus disease (*Gymnosporangium*) native to the wild crabapple from which it spread to the cultivated varieties of apples. It lives nearly two years on the common red cedar, until its spores mature in the spring of the second year. These windblown spores must then attack crabapple or other apple leaves and fruit, on which they form an orange-colored rust. During the summer, the spores formed on the apple cannot continue to live unless they are again transferred to the red cedar. Wheat rust (*Puccinia graminis*) and oat rust have been found to be caused by a fungus that lives first on the common barberry, then spreads to grains in the vicinity, and back to the barberries. White pine blister-rust (*Taphrina*) occurs on the commercially valuable five-needled pines of the U.S. It lives first on black currant bushes and gooseberry bushes, from which it spreads to the white pines. In certain states, the cultivation of black currants and gooseberries is prohibited to prevent further pine destruction. Asparagus rust (*Puccinia asparagi*) is a native disease of the Old World brought to America in 1896. Its hosts are not fully known, but it was finally conquered by breeding a rust-resistant strain of asparagus.

Rust, in chemistry, reddish-brown iron oxide, mixed with hydroxides and carbonates, which occur on the surface of iron or steel as a result of its exposure to moisture and air. Rust is a form of oxidation or union with oxygen. Chemically, oxidation refers to any reaction in which a substance loses electrons or a share in electrons. Thus the process of rusting is an electrochemical process, in which there is a movement of electrons away from certain areas of the iron being oxidized. These areas, where metallic iron is losing electrons, serve as anodes. Other areas, which are gaining electrons, serve as cathodes. At the anode area, when an atom of metallic iron loses two electrons, it becomes the positive ferrous ion. When this ferrous ion loses an electron, it becomes a ferric ion. These ions pass into solution, and corrosion or rusting is taking place. The ions in solution migrate through the moisture film on the surface of the iron toward the cathode area. Some of the ferrous ions on this surface are oxidized to ferric ions by the action of the oxygen in the air. When ferrous and ferric ions meet the hydroxyl ions moving from the cathode area toward the anode area, they unite and precipitate as ferrous and ferric hydroxides, which the carbon dioxide of the air gradually changes to a mixture of hydroxycarbonates, the familiar rust found on iron.

A consideration of the factors involved in rusting presents several ways of limiting corrosion. The areas which become anodes in iron are usually those in which the metal has been strained, or which contain impurities lower in the electrochemical series of the metals, and such impurities themselves may serve as the cathode areas. Areas tend to become cathodes where there is an abundance of oxygen, and areas lacking oxygen tend to become anodes. Absolute dryness will prevent the electrochemical process from developing. Iron free from all impurities is highly resistant to rusting, but absolutely pure iron is difficult to obtain. The iron may be given a protective coating which will exclude both air and moisture, such as paint, plastic, oils, etc., or it may be coated with a metallic coating such as tin, zinc, or chromium. Acid soils encourage the corrosion of underground pipes. Similarly, circulating water, which constantly supplies additional oxygen, tends to start the rusting process. Sea water is most damaging to iron because it contains ions which are excellent conductors of electricity and so hasten the electrochemical process. Stray currents of electricity from power lines may cause rapid corrosion of underground pipes. However, if underground pipes are given a continuous charge of negative electricity, the entire pipe will become a cathode, with no anode areas, and thus corrosion will be prevented. In heavy iron boilers, a rod of zinc, which is higher than iron in the electrochemical series, may be inserted. Then the boiler becomes the cathode, and the zinc the anode. The zinc will then gradually erode away, and must be replaced to prevent corrosion from starting in the boiler itself. Chromates, phosphates, or silicates decrease rusting by forming a protective film over the anode surfaces. Salts of calcium, magnesium, zinc, or nickel may decrease corrosion by precipitating as carbonate or hydroxide over the cathode surface, and so preventing the necessary oxygen at the cathode area.

"BABE" RUTH



ERNEST RUTHERFORD

Rutgers, The State University (*rŭt′gẽrz*), a state institution of higher learning at New Brunswick, N.J., founded in 1766 as Queens Coll. and renamed in 1825. It comprises the University Coll., Douglass Coll. (for women), and schools of agriculture, arts and sciences, ceramics, chemistry, education, engineering, graduate work, journalism, library service, and social work. A branch in Newark, N.J., comprises schools of arts and sciences, business administration, law, and pharmacy; there are also branches at Camden, Jersey City, and Paterson, N.J. The Rutgers Inst. of Microbiology is a world center for that science. The annual student enrollment totals *ca.* 14,400, and there are *ca.* 1,100 members of the faculty. The library has more than 1,500,000 volumes. The physical plant is valued at *ca.* $100,000,000.

Ruth (*rōōth*), BOOK OF, a book of the Old Testament, which is generally placed immediately after the Book of Judges. It gives an account of Ruth, a Moabitess, who was married to Mahlon, son of the Hebrews Elimelech and Naomi. After the death of Elimelech and Mahlon, Ruth accompanied Naomi to Bethlehem, where she went into the field as a gleaner, but later married her kinsman the aged Boaz. She became the mother of Obed, and through him the great-grandmother of David and the ancestress of Jesus Christ. The Book of Ruth is canonical.

Ruth (*rōōth*), GEORGE HERMAN, best known as "BABE" RUTH, baseball player, born in Baltimore, Md., Feb. 6, 1895; died in New York City, Aug. 16, 1948. He began his career in professional baseball with the minor-league Baltimore team in 1914 as a pitcher-outfielder; his first season was so successful that he entered the major leagues with the Boston Red Sox the following year. In 1920 he was purchased by the N.Y. Yankees, with whom he remained until 1934, when he retired as a player. In 1935 he spent a short time as an official with the Boston Braves, but he left the team before the end of the season. He coached the Brooklyn Dodgers in 1938 and then retired from baseball altogether. Although successful in every position in which he ever played, Ruth was most famous as a home-run hitter. His record of 60 for the 1927 season has never been bettered, and he totaled 714 home runs during his 19 years in major-league baseball. In April 1947 he became consultant to the Ford Motor Co. in connection with its participation in the American Legion's junior baseball program.

Ruthenia (*rōō-thē′nĭ-ȧ*), a part of the Ukrainian Soviet Socialist Republic (*q.v.*), bounded by Poland, Rumania, Hungary, and Slovakia. Formerly a part of Czechoslovakia, it lies among the Carpathian Mts. Its area is 4,871 sq. m. Farming is the chief industry, with vine-culture secondary. Corn, oats, wheat, and potatoes are chief crops. The capital is Uzhorod (pop. *ca.* 25,000). Ruthenians, constituting over 60 per cent of the population, are a branch of the Slavic race that adheres to the Greek Orthodox Church and has its own language. Ruthenia was incorporated into Czechoslovakia by the Trianon Treaty of 1920, but remained semiautonomous. In 1938 and 1939, Hungary annexed Ruthenia, and after the defeat of the Axis Powers (*q.v.*), the government in Prague ceded the territory to the Soviet Union (June 1945). Population, *ca.* 750,000.

Rutherford (*rŭTH′ẽr-fẽrd*), a borough in Bergen County, N.J., 8 m. N.W. of Jersey City. It is between the Passaic and the Hackensack Rivers, on the Erie R.R., and is a residential suburb and shopping center for southern Bergen County. It was laid out in 1862. Population, 1950, 17,411.

Rutherford, SIR ERNEST, 1ST BARON RUTHERFORD OF NELSON, physicist, born at Nelson, New Zealand, Aug. 30, 1871; died in London, Oct. 19, 1937. His brilliant research in radioactivity at McGill and Manchester Univs. brought him the Nobel Prize for Chemistry in 1908 and knighthood in 1914. Rutherford made valuable contributions to the knowledge of the nature of radioactive transformations, the electrical structure of matter, and the nucleus of the atom. He revolutionized physical and chemical thought, opening up new fields of experiment, including the vast possibilities of nuclear fission. His best-known work is "Radioactive Substances and Their Radiations."

Rutland (*rŭt'lạnd*), county seat of Rutland County, Vt., 60 m. s. of Burlington, on the Burlington & Rutland, the Delaware & Hudson, and other railroads. It is served by a number of bus lines. An airport is located in Clarendon, 5 m. s. of the city. The noteworthy buildings include the county courthouse, the women's reformatory, the memorial armory, and the Federal building. Among the manufactures are beverages, clothing, maple-sugar equipment, boilers, scales, lumber products, monuments, dairy supplies, buttons, hardware, and machinery. A town was established on the present site in 1761 and the city was chartered in 1892. Rutland was one of the state capitals from 1784 to 1804. Population, 1940, 17,082; 1950, 17,659.

Rutledge (*rŭt'lĕj*), EDWARD, statesman, born at Charleston, S.C., Nov. 23, 1749; died Jan. 23, 1800. He studied law at London, England, where he was called to the bar, and began a successful practice in Charleston in 1773. The following year he was elected to the First Continental Congress and two years later was a signer of the Declaration of Independence. In 1780, he was taken prisoner while commanding at the siege of Charleston and was detained at St. Augustine for 11 months. He was elected to the U.S. Senate in 1794, where he was an influential worker, and four years later became governor of South Carolina.

Rutledge, JOHN, brother of Edward Rutledge, born at Charleston, S.C., in 1739; died July 23, 1800. He studied law at London, England, and began the practice of that profession in Charleston in 1761. Four years later he took part in the Stamp Act congress at New York and was a member of Continental Congress from 1774-75. He took part in drawing up the state constitution, was president of the state of South Carolina, and afterward served as governor under the new constitution. During the Revolutionary War he was active in the field, serving under Greene until 1782. Soon after he was elected to Congress, where he opposed the abolition of the slave trade, and in 1789 became a justice of the supreme court. Washington appointed him chief justice of the supreme court in 1795, but he lost his reason and the Senate refused to confirm the appointment.

Ruysdael (*rois'dȧl*) or RUISDAEL, JACOB VAN, 17th century landscape painter, born 1628(?), in Haarlem, Holland; died there in 1682. He lived most of his life in Amsterdam, the freedom of which city he was granted in 1659. Although he is now appreciated as the best representative of contemporary Dutch landscape painting, he was not so evaluated in his lifetime and died in poverty. His landscapes, forests, waterfalls, stretches of the countryside, treated in all their nuances of light and shadow and approached in a realistic way, breathe a dominantly melancholic mood. Small accidental things in nature, such as water plants or logs, a little duck or fallen leaves, enhance the well-balanced impression of his canvases, the whole being warmly enveloped in dark greenish and brownish tones. Though he saw nature in all its grandeur and width, he also had a touch of intimacy. His works are represented in almost all museums in Europe and some in the U.S.; among his best known are "The Swamp," "The Waterfall," "Castle of Blentheim," and "The Jewish Graveyard." Besides his paintings he also produced some fine etchings.

Ruysdael, SALOMON VAN, landscape painter, born in 1600; died in 1670. He was mostly interested in landscapes in combination with vistas of his native surroundings, such as the views of Holland's canals, villages, and courtyards, all organized into smooth color combinations. He was the uncle and probably teacher of Jacob van Ruysdael (*q.v.*).

Ruyter (*rī'tẽr*), MICHAEL ANDRIAENSZOON DE, admiral, born in Flushing, Holland, Mar. 24, 1607; died Apr. 29, 1676. He was descended from a family of moderate circumstances and entered the naval service as cabin boy when only 11 years old. Careful attention to the duties of a seaman caused him to be promoted to captain in 1635, and he was made rear admiral in 1645. He served in the East Indies for some years, fought against the pirates off the northern coast of Algeria in 1647, and in 1652 commanded a squadron in the war against England. In 1653, he defeated Blake off Dover, and in 1666, commanded in conjunction with Van Tromp against the British fleet under Prince Rupert and the Duke of Albemarle, but the battle was not decisive. The following year he destroyed several English vessels on the Medway, and inflicted material damage at Rochester and Gravesend. In 1671, he commanded against the allied fleet of France and England, but the results were indecisive. He was sent against the French in the Mediterranean in 1675, where he fought a desperate battle off the coast of Sicily, but died from the result of a wound. His name has been commemorated by a splendid military monument at Amsterdam.

Ružička (*rōō'zhēch-ḳä*), LEOPOLD, chemist, born Sept. 13, 1887, in Vukovar, Yugoslavia. A professor of chemistry at the Swiss Federal Inst. of Technology in Zurich from 1918, he first won a reputation among chemists for his synthesis of musk. Later he became interested in sex hormones, particularly the male hormones, androsterone and testosterone. In 1934, he was successful in synthesizing androsterone and the following year synthesized the more potent testosterone. For this work he shared the Nobel Prize for chemistry in 1939 with Adolph Butenandt, who had been the first to isolate androsterone.

Ryder (*rī'dẽr*), ALBERT PINKHAM, painter, born in New Bedford, Mass., March 19, 1847; died in Elmhurst, N.Y., March 28, 1917. At the age of 20 he went to New York, where he spent the rest of his life, largely in solitude and work. Mostly self-taught, he studied briefly with William E. Marshall, the engraver, and at the National Acad. of Design. His sensitive and imaginative paintings are at their best in landscapes and moonlit seascapes. He is represented in most of the major American galleries. Among his best-known works are "Toilers of the Sea," "The Curfew Hour," "The Bridge," "Death on a Pale Horse," and "The Flying Dutchman."

Rye (*rī*), an important cereal plant. It is native to the Levant, but is cultivated extensively in temperate climates, especially in Western Europe. Rye is nearly allied to wheat, but its nutritive qualities are less, the proportion being about 64 to 71. It is hardier than wheat and is adapted to poorer and lighter soils. *Ergot,* a fungus disease of rye, makes it harmful. In most sections of North America rye may be pastured in the early stages of its growth, but this is not advisable in dry regions. It does not grow as far north as barley, but yields well in sections that are too cold for wheat. In most cases it is sown in the fall and ripens early in the summer, somewhat earlier than wheat. The species are not so numerous as other cereals. Those cultivated most extensively are known as *spring* and *winter* rye, depending on whether they are sown in the spring or in the autumn. Winter rye is usually more productive.

Rye forms the breadstuff, known as "black bread," of a large number of people, especially in Russia, Germany, Holland, Sweden, and Norway. What is commonly known as "rye bread" contains a mixture of rye and wheat flours. Rye is used extensively in making *whisḳey,* especially *Hollands,* and the tough straw is valuable for stuffing mattresses and for use in making brick, baskets, and hats. Both winter and spring rye are grown in the U.S., where the annual production is over 50,000,000 bushels. New York, Pennsylvania, Wisconsin, Iowa, Illinois, Missouri, Michigan, Minnesota, North Dakota, and Kansas are among the leading rye-producing states. Ontario produces more than half of the rye grown in Canada, having an annual yield of about 1,225,000 bushels.

Rye-House Plot (*rī'hous plŏt*), a conspiracy planned in England in 1683, by the Whig party, with the object of assassinating Charles II and the Duke of York, afterward James II. The plan was to be carried out near a farm called Rye-house as the two returned from the Newmarket races, but they passed the vicinity of the intended attack earlier than was expected, thus frustrating the scheme. The plot was discovered and Lords Essex, William Russell, Algernon Sidney, and others were placed under arrest. The first mentioned committed suicide in the Tower and both Russell and Sidney were beheaded, though neither of the three were in any way connected with the plot. However, Lieutenant Colonel Walcot, one of the real contrivers of the plot, was also apprehended and brought to the block for treason.

Rykov (*rē'ḳôf*), ALEKSEI IVANOVICH, public official, born in Russia in 1881; died in 1938. A revolutionary, he met with arrest, prison, and exile through much of his youth. As an associate of Lenin (1917), he aided in effecting the Russian Revolution and in establishing the new Soviet regime. He headed the Supreme Economic Council and was a member of the powerful Politburo until Lenin's death (1924). He was president of the Soviet of People's Commissars (1924-30), but was ousted from the post for political disagreement with Stalin (*q.v.*). Reinstated (1931-36) after public recantation of his arguments, he was again arrested (1936), tried, and executed.

Ryswick (*rĭz'wĭḳ*) or RIJSWIJK, a village of Holland, 2 m. S.E. of The Hague. It is celebrated for the peace of Ryswick, which was concluded here on Sept. 20, 1697. This treaty ended the war waged by the allied armies of Germany, Holland, Spain, and England against Louis XIV of France on account of his claim to the French throne, which was recognized by the treaty. France, Spain, Holland, and England signed the treaty on Sept. 20, and Germany agreed to it on Oct. 30.

Ryukyu (*rĭ-o͞o'ḳū*), or RYUKYU RETTO, or LUCHU, a chain of islands which form an arc of *ca.* 600 m. between Japan and Formosa and include the Sakishima, Okinawa, and Amami island groups. The land area is *ca.* 848 sq. m. Beginning in the 14th century the islanders paid tribute to China, but after 1609, when they were conquered by Japan, they had to pay tribute to both China and Japan. In 1879 the islands became a part of Japan, and China recognized this status in 1895. During World War II the islands were taken by the U.S. and in 1950 placed under a U.S. civil administration. In 1952 a native government, under U.S. supervision, was established. The Amami group was returned to Japan in 1953. Population, 1950, 917,400. See also *Oḳinawa.*

S (*ĕs*), the 15th consonant and 19th letter of the English alphabet, forming a sibilant, and representing a hissing sound. The letter is derived from the original Indo-Germanic but came to us from the Latin through the Greek *sigma.* It is made by placing the front of the tongue against the roof of the mouth above the front teeth, an opening being left just behind the tip, and then emitting the vocalized breath. S has two sounds, known as *sharp* or *hard,* and *soft* or *sonant.* The former is represented in *this, thus, sin,* and the latter represents the sound of *z,* as in *muse, music, wise.* It is silent in some words, as in *viscount, aisle,* and *island.*

Saar (*zär*), a river in the southern part of Germany. Rising in the Vosges Mts., in eastern France, in the department of Moselle, it flows northwest across the German border and through Saarland until it joins the Moselle River 5 m. s.w. of Trier. It is about 150 m. long and navigable from its mouth to Sarreguemines, a distance of *ca.* 75 m.

Saarbrücken (*zär′brü-kẹn*), a city of Germany, capital of Saarland, situated on the Saar River, *ca.* 100 m. s.w. of Frankfurt, Germany. It is the major industrial center of the Saar coal-mining district, producing chiefly steel and machinery. Population, 1956, 121,950.

Saarinen (*sä′rĭ-nĕn*), ELIEL, architect, born in Helsingfors (now Helsinki), Finland, Aug. 20, 1873; died in Bloomfield Hills, Mich., July 1, 1950. Educated at the Polytechnic Inst. in Helsinki, he settled in the U.S. (1923), after having gained recognition as a proponent of modern functional design. Among his works were the Finnish Pavilion at the Paris Exposition (1900) and the Berkshire Music Center in Stockbridge, Mass. (1941). His son, EERO SAARINEN (born in Kirkkonummi, Finland, Aug. 20, 1910; died in Ann Arbor, Mich., Sept. 1, 1961), was also an outstanding architect. He designed the General Motors Technical Center (Detroit, Mich.) and the T.W.A. terminal building at Idlewild, N.Y., and collaborated on designs for the U.S. Air Force Acad. and the Lincoln Center, New York City.

Saarland (*zär′länt*), a *Land* (state) of the Federal German Republic, located in the southwestern part of the country, with an area of 991 sq. m. As one of Germany's most important industrial areas, it is notable for its vast coal mines (1956 production, 17,300,000 tons), iron and steel plants, and such industries as machine and metal working and the production of glass and chemicals.

The Saar territory was separated from Germany by the Versailles Treaty (1919) and administered by France under League of Nations supervision until 1935, when a plebiscite resulted in its return to Germany. During World War II the area saw much heavy fighting, and the industrial centers were heavily bombed. The territory became part of the French zone of occupation after World War II. In 1947 the population voted for economic union with France. The region had semiautonomy from Jan. 3, 1948, until Oct. 27, 1956, when the Federal German Republic and France signed the Luxemburg agreement, which provided for the return of the territory to Germany on Jan. 1, 1957, and for economic reintegration with Germany by Dec. 31, 1959. Population, 1956, 998,185.

Saavedra Lamas (*sä-ä-vä′thrä lä′mäs*), CARLOS, teacher and statesman, born in Buenos Aires, Argentina, Nov. 1, 1880(?); died there, May 5, 1959. He was educated at the Univ. of Buenos Aires and later taught international law there. As minister of foreign affairs (1932-38), he drafted the antiwar pact signed (1933) by 13 American republics, and he sponsored the peace conference which ended (1935) the Chaco War between Bolivia and Paraguay. He was president of the League of Nations assembly in 1936 and won the Nobel Peace Prize that same year.

Sabadilla (*săb'a-dĭl-ȧ*) or CEBADILLA, native Mexican plant whose seeds have, for centuries, been used in medicine.

Saba (*sä'bä*) or SHEBA. See *Sheba.*

Sabal (*sā'băl*), a kind of dwarf fan palm with creeping stems and long leaves, at home in the American tropics.

Sabatier (*sȧ-bȧ'tē-ā*), PAUL, chemist, born in Carcassonne, France, Nov. 5, 1854; died in Toulouse, Aug. 16, 1941. Sabatier was professor of chemistry at the Toulouse Faculté des Sciences from 1884 to 1930 and became famous for his research in physical chemistry. His other investigations dealt with the hydration of organic combinations by catalysis, using finely divided metals, and the transformation of carbon monoxide into methane, unsaturated hydrocarbons and acids into saturated ones, and benzal into cyclohexane. In 1912, Sabatier received the Nobel Prize for chemistry, with Victor Grignard (*q.v.*). Sabatier summarized the results of his research in his book, *"La Catalyse en Chimie Organique"* (1913).

Sabatini (*sä-bä-tē'nē*), RAFAEL, author, born at Jesi, Italy, in 1875; died in Adelboden, Switzerland, Feb. 10, 1950. Educated in Switzerland and Portugal, he served in the Intelligence Division of the British War Office in World War I. Writing in English, he romanticized history in such tales as "The Lion's Skin" (1911), "Torquemada and the Spanish Inquisition" (1913), "Scaramouche" (1921), "Chivalry" (1935), and "Columbus" (1942). Successful motion pictures were made from his novels "The Sea Hawk" (1915) and "Captain Blood" (1922).

Sabbatai Zevi (*sạ-băt'â-ī tsĕ-vē'*), 1626-76, a Jewish cabalist of Turkey who claimed that he was the promised Messiah of the Jewish people. He predicted that the year 1666 would bring the redemption of the Jewish people throughout the world. In 1667, he was imprisoned in Smyrna, and saved his life by professing Mohammedanism.

Sabbatarians (*săb-ȧ-târ'ĭ-ạnz*), Christian sects celebrating the Sabbath on Saturday instead of Sunday. Among them are the Seventh-day Adventists and Seventh-day Baptists.

Sabbath (*săb'ạth*), the seventh day of the week, appointed by the Mosaic law for cessation from labor and the worship of God. It was set apart to commemorate the fact that God created the world in six days and rested on the seventh. Keeping holy the Sabbath is enjoined by the Fourth Commandment in Exodus, because of God's having rested after the creation, and in Deuteronomy its observance is demanded because of the deliverance of the Hebrews from Egyptian bondage. Any mention of the Sabbath in the New Testament implies the seventh day of the week, but the Christian fathers in general drew a distinction between the Sabbath and the Sunday as early as the first three centuries. They regarded the Jewish Sabbath as obsolete and looked upon Sunday as the divinely instituted Lord's Day, joyous in its character, celebrating the resurrection of Christ. The Council of Laodicea, in 366, decided that Christians are to observe Sunday.

The name Sabbath is used by most Christians to designate the Lord's Day, or Sunday, though Jewish writings and those of Adventists and other Christian sects making use of the name imply that Saturday, or the Sabbath, is meant. The Sabbath was observed with great rigidity in the time of Christ. At that time Jews were not allowed to go from their city a distance greater than 2,000 cubits, about a mile, which came to be called a *Sabbath-day's journey*. Thus, every seventh day was one of rest, and every seventh year was known as the *sabbatical year,* in which the lands were not cultivated and the crops and fruits produced became the property of all in common. When the Pharisees denounced Christ as a Sabbath breaker because he rendered service to mankind, he replied: "The Sabbath was made for man and not man for the Sabbath: therefore the Son of Man is Lord also of the Sabbath."

Saber-Toothed Tiger (*sā'bẽr-tōōth'd tī'gẽr*), an extinct catlike animal, skeletons of which have been found in South America. Larger than lions, these cats were characterized by flat, serrated upper canine teeth 7 in. long. They probably lived during the glacial period.

Sabin (*sā'bĭn*), FLORENCE RENA, anatomist, born in Central City, Colo., Nov. 9, 1871; died in Denver, Oct. 3, 1953. She was educated at Smith Coll. and at Johns Hopkins Univ.; she afterward became the first woman teacher at the latter school. She was assistant in anatomy there (1902), associate (1903-05), associate professor (1905-17), and professor of histology (1917-25). She became the first woman member of the Rockefeller Inst. for Medical Research (1925-36) and the first woman member of the National Acad. of Sciences. She was best known for her research on the lymphatic system, her discovery of the origin of the red corpuscle, and her research on tuberculosis.

Sabine (*sȧ-bēn'*), a shallow river of the U.S., which rises in northeastern Texas and, after a course of 380 m. flows into the Gulf of Mexico. It enters the gulf through Sabine Pass, a bay about 18 m. long and 8 m. wide. The Sabine River forms the principal part of the boundary between Texas and Louisiana.

Sabines (*sā'bīnz*), or SABINI, a people of ancient Italy, who occupied a large part of northeastern and middle Italy. Amiternum was their capital and occupied a place near the present town of Aquila. The Sabines were closely allied to the Latins. They were an important nation before Rome was founded and it is thought that they occupied the Quirinal Hill, while Romulus built Rome on the Palatine Hill. The Sabines ceased to exist as an independent nation in 290 B.C., when the Romans incorporated them as a part of Rome. History contains many evidences that the population of Rome included an important Sabine element and that its influences became intermixed with those of Latin origin, both in religious rites and civil institutions. No remains of the Sabine language in the form of inscriptions have been discovered, but coins issued in Rome at an early period give evidence that the Sabine language had a notable influence upon that of the Romans.

Sable (*să'b'l*), a flesh-eating mammal of the weasel family. It is about the size of the pine marten, to which it is closely related. The color is brownish in summer, but turns much darker in winter, in which condition the fur is highly esteemed as an article of commerce. The value of a single skin ranges from $25 to $75, depending on the fineness and color. In summer the skin is less valuable, owing to the fact that it is characterized more or less by white spots on the head and grayish markings on the neck. The sable is native to the northern part of Europe and Asia. It lives principally in trees, hunting by night and lying concealed during the day The *pekan* of North America is frequently called the *Hudson Bay sable* and its skin is sometimes used to imitate that of the true *Russian sable*.

Sable Island (*să'b'l ī'lạnd*), an island in the Atlantic, situated 110 m. E. of Nova Scotia. It has a low and sandy surface, is about 25 m. long, and from 1 to 5 m. wide. The island is under the government of Nova Scotia. It has two lighthouses and a hospital for shipwrecked persons. Many disastrous accidents at sea have occurred in the vicinity. There are valuable fisheries. Vegetation consists chiefly of grasses, peas, potatoes, strawberries, and cranberries.

Sac (*săk, sôk*), or SAUK. See *Sacs and Foxes*.

Sacajawea (*săk-ạ-jạ-wē'ạ*), common form of the name of SACAGAWEA or SAKAKAWEA, an Indian woman, born in Idaho, *ca.* 1787; died in Ft. Manuel, near the Dakota border, Dec. 20, 1812. The daughter of a Shoshone chief, she was captured as an infant by the Hidatsas and later sold to a Canadian living with the tribe, Toussaint Charbonneau, who married her in Indian rites. In 1805-06 they both accompanied the Lewis and Clark expedition through the west. With her infant on her back, Sacajawea exhibited great courage and fortitude and was of extraordinary help to the explorers.

SACAJAWEA

Controversy exists about her death, one theory maintaining that she returned to her people, the Shoshones, and died, at nearly 100, in 1884.

Saccharin (*săk'kȧ-rĭn*), a white crystalline compound derived from coal tar. It was discovered at Johns Hopkins Univ. by Ira Remsen and Charles Fahlberg in 1879. Saccharin is soluble in hot water, ether, and alcohol, and melts at 220° C. It is 300 to 550 times sweeter than cane sugar, its sweetness varying with the purity of the product, and one grain being perceptible in 10,000 grains of distilled water. Manufacturers of confectionery use it to a considerable extent, especially in Germany, and it is also employed in brewing. It is recommended in some diseases, as diabetes, though it is not considered a food. The name *saccharin* in an extended sense is applied to any substance having the quality of sugar, such as honey, cane sugar, glucose, and other saccharin compounds.

Sacco and Vanzetti Case (*să'kô, văn-zĕt'ĭ*), the circumstances surrounding the prosecution of Nicola Sacco and Bartolomeo Vanzetti, two Italians charged with the murder and the robbery of a paymaster and a guard at South Braintree, Mass., Apr. 15, 1920. They were brought to trial before Judge Webster Thayer at Dedham and convicted on July 14, 1921. Before the verdict, the anarchistic views of the defendants were fully revealed; after the conviction, which failed to convince a large part of the interested public, radical demonstrations took place throughout the world. Despite evidence of the innocence of the accused, including a confession of guilt by another man, Judge Thayer was upheld by both the Massachusetts Supreme Court and Gov. Fuller, and motions for a new trial were repeatedly denied. In the face of a notable defense by countless liberal figures, including Harvard Univ. professor (later U.S. Supreme Court Justice) Felix Frankfurter, the two men were executed on Aug. 23, 1927.

Sachs (*zäķs*), HANS, famous meistersinger, born in Nuremberg, Germany, Nov. 5, 1494; died Jan. 19, 1576. After his education at the Nuremberg Latin School, 1509, he was apprenticed to a cobbler. Interested in literature and singing, he received instruction from Leonhard Nunnenpeck of the Nuremberg Meistersinger School. As was the custom, Sachs spent several years as a wandering minstrel, plying his trade and reciting in many German cities. He returned to Nuremberg in 1516 and in the following year became master of his guild.

Sachs was one of the best and most productive of meistersingers. By 1567, according to his own count, he had composed 4,275 master songs for the Nuremberg Meistersinger School, 1,700 fables and tales in verse, and 208 plays. In all, he left about 6,300 pieces. He favored the Reformation, and many of his hymns were used extensively to promote that religious movement. Among other things he wrote four dialogues and a poem, "The Nightingale of Wittenberg," in honor of Martin Luther. Of greatest interest today are his gnostic poems and his dramatic pieces, especially the Shrovetide plays, "St. Peter and the Goat" and "The Dissimilar Children of Eve." His farces, noted for their humor and imaginative qualities, include "Der Fahrende Schüler in Paradies." His works were popular until almost the middle of the 17th century and were revived by Goethe in his *"Hans Sachsens Poetische Sendung"* (1776). Sachs figures as one of the chief characters in Wagner's opera, "Die Meistersinger von Nürnberg."

Sackets Harbor (*săķ'ẹts här'bẽr*), a village in Jefferson County, New York, on Black River Bay, 8 m. E. of Lake Ontario. It is situated at the mouth of the Black River, has a good natural harbor, and is a port of entry. Communication is furnished by steamers and by the New York Central R.R. The points of interest include the Federal military post, the Madison Barracks, and Ft. Tompkins Park. In the War of 1812 it was important as a port and for the building of the frigates *Superior* and *Madison*. The British made two attacks on it, but they were defeated with a loss of 150 men. Settled around 1801, it was incorporated in 1814. Population, 1950, 1,247.

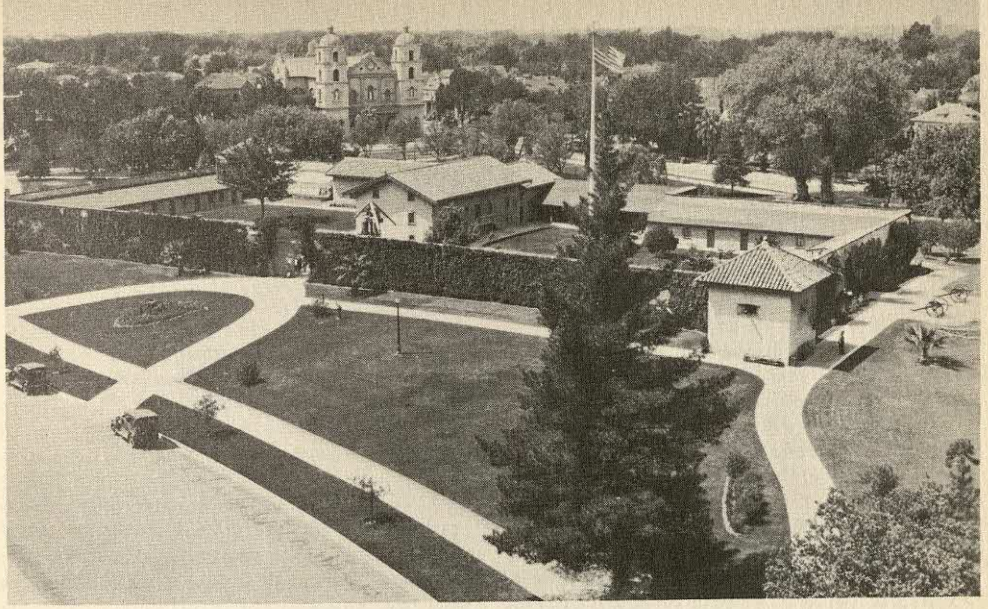
Sackville (*săķ'vĭl*), THOMAS, Earl of Dorset, statesman and poet, born at Buckhurst, England, in 1536; died Apr. 19, 1608. He studied law at the Inner Temple and was called to the bar. He joined Thomas Norton in writing the tragedy "Ferrex and Porrex," which was afterward called "Gorboduc." This was the first English tragedy to be written in blank verse and was performed at the Inner Temple on Twelfth Night. In 1566, he was made Lord Buckhurst and soon after went to France as a minister. He became Lord Treasurer of England in 1599. Sackville sat as a member of the court that tried Mary, Queen of Scots, and presided at the trial of the Earl of Essex. He was buried in Westminster Abbey.

Saco (*sạ'ķô*), a river of New England, which rises in the White Mts. of New Hampshire and flows toward the southeast through Maine. The main branch passes through the noted Crawford Notch of the White Mts. A number of falls and cataracts in its course afford valuable water power. The falls include one of 42 ft. at Saco and one of 72 ft. at Hiram. The entire length is 160 m., but it is navigable only to Saco, which is the head of tidewater.

Saco, a city in York County, Maine, on the Saco River, 20 m. s.w. of Portland, on the Boston & Maine R.R. The river is crossed within the city by four bridges and supplies water power for industrial purposes. The noteworthy features include the Dyer Library, the Thornton Acad., the York Institute Library, and Pepperell Park. Among the manufactures are cotton and woolen goods, boots and shoes, lumber products, and machinery. Old Orchard Beach is a popular summer resort, about 3 m. from Saco. Saco was settled in 1631 and was first incorporated as Pepperellboro, but was chartered under its present name in 1867. Population, 1950, 10,324.

Sacrament (*săķ'rȧ-mẹnt*), the name of certain religious rites in the Christian Church. The term was used by the early writers to denote any mysterious thing or doctrine, but later it became restricted to particular rites, which are believed by some churches to impart to Christians who use them an invisible grace. The Greek, the Armenian, and the Roman Catholic Churches hold to the seven sacraments of baptism, confirmation, the eucharist, penance, extreme unction, holy orders, and marriage. Protestants generally believe only in two sacraments, those of baptism and the Lord's Supper, on the ground that the New Testament mentions only these two as having been instituted by Christ. Luther and Melanchthon accepted these and inclined toward adding penance as a sacrament. While the Friends reject the doctrine of the sacraments, the Mennonites and Dunkards consider washing of the feet as an obligatory ordinance, which they administer with baptism and the Lord's Supper.

Sacramento (*săķ-rạ-mĕn'tô*), the largest river in California. It rises near Mt. Shasta in Siskiyou County, in the northern part of the state, and flows in a generally southerly direction into Suisun Bay, an inlet of San Francisco Bay, and thence into the Pacific Ocean. On its upper course, near Redding, Calif., is Shasta Dam (*q.v.*). Its longest headstream is the Pit, or Upper Sacramento, River, which rises in Goose Lake in the northeast; its chief



SUTTER'S FORT, SACRAMENTO

tributaries are the Feather and San Joaquin rivers. The Sacramento is 382 m. long and is navigable for 180 m.

Sacramento, capital of California and seat of Sacramento County, in the central part of the state, at the confluence of the Sacramento and American rivers, 84 m. N.E. of San Francisco. It is served by the Southern Pacific Lines and Western Pacific R.R. Sacramento Municipal Airport is *ca.* 3.5 m. s. of the city, and McClellan and Mather Air Force bases are 10 m. N.E. and 12 m. E., respectively. The city has an area of *ca.* 44 sq. m. Of its system of some 30 parks comprising *ca.* 1,500 acres, the largest is William Land Park, with a zoo. Institutions of higher learning include Sacramento State Coll., Sacramento City Coll., and American River Junior Coll. The agricultural school of the Univ. of California is at Davis, 13 m. w. Sacramento's cultural facilities include Crocker Art Gallery and the state library. Among points of interest are Sutter's Fort, the state capitol, and the cathedrals of the Blessed Sacrament and of Our Lady of Guadelupe.

Sacramento has diversified industries, chief of which is rocket and missile manufacture. Food-processing, long first in rank, is now second. There are also large railroad shops. Other manufactures include soap, furniture, fabricated steel, and brick and clay products. The surrounding area has deposits of gold and natural gas, and produces livestock, poultry, dairy products, pears, corn, alfalfa, hay, sugar beets, hops, tomatoes, and rice. In 1958 the city had a value added by manufacture of $77,895,000. It is the center of the Sacramento Standard Metropolitan Statistical Arca (pop., 1960, 502,778), which includes all of Sacramento County.

The area was settled in 1839 by Capt. John A. Sutter, as New Helvetia. The discovery of gold nearby in 1848 brought miners and prospectors, after which the town of Sacramento was laid out. It was incorporated as a city in 1850, and became state capital in 1854, terminus of the first railroad in California in 1856, and terminus of the Pony Express (*q.v.*) in 1860. In 1900 the city had a population of 28,282; in 1930, 93,750. Its decade of greatest growth was between 1950, when the population was 137,572, and 1960, when it was 191,667.

Sacred Heart (*sā'krĕd härt*), SOCIETY OF, a society of the Roman Catholic Church founded by Madeleine Sophie Barat at Amiens, France, in 1800. The purpose of this society, not an order in the strict sense, is the education of girls. The society maintains over 150 communities throughout the world. Its mother house is in Rome, Italy. In the U.S., the first house was founded in St. Louis, Mo., in 1818.

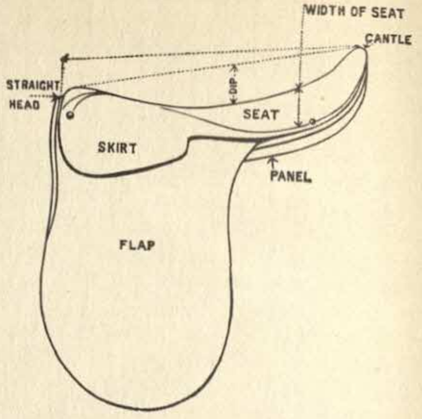
Sacrifice (*săk'rĭ-fīs*), an offering to God, either as a thanksgiving or an atonement. The practice of offering sacrifices has prevailed from remote antiquity and it is not certain how it originated. Some writers contend that it was instituted by God, while others think that it originated in the desire of man to approach the Deity. Some look upon sacrifices as a compensation to the gods, and so they contend that their efficacy depends more or less upon the value of the offering, or upon the exertion required by the individual to attain and offer the sacrifice. The offering of a thing of value, as gold or silver, was not looked upon as being of greater efficacy than a blood offering, such as a slaughtered animal, since the latter represented both value and human exertion.

Peace offerings consisted usually of one or more animals, certain parts of which were burnt upon the altar, while the remainder was given to the priest to be eaten by him and his family. *Sin offerings* were sacrifices of various kinds for the remittance of sins. Among the Jews it was customary to offer the Passover lamb in memory of the deliverance from Egypt. The book of Leviticus describes the custom of offering sacrifices among the Hebrews. However, this practice extended to the Greeks, Romans, Brahmans, Mexicans, and practically to all primitive and ancient peoples. In many countries it was customary to offer human sacrifices, but in most instances the blood sacrifices were confined to the offer of animals.

Sacs and Foxes (*săks, fŏks′ĕz*), the names of two tribes of American Indians which are closely associated in history. They are of the Algonquin family. The Sacs, pressed westward by the Iroquois, settled near Green Bay, Wis., where they were joined subsequently by the Foxes. Both tribes were courageous as warriors and were noted as enemies of the French. They assisted the English in most of their wars. In 1712 they made an attack upon Detroit, but were compelled to retreat to Lake St. Clair, where they met defeat. Later they served under Pontiac and during the Revolution supported the English. The Rock River Sacs aided Great Britain in 1812 and the Foxes aided the English in attacking Sandusky.

The Sacs ceded their land in 1816 and became wholly identified with the Foxes, who ceded lands in 1824 and in 1830. In 1832 they fought under Black Hawk to recover a part of their lands, but gave up more of their territory in a treaty with Gen. Scott at the close of the Black Hawk War. Later they removed to central Iowa, and in 1842 most of them were removed to the Osage Reservation, now Oklahoma. A party of 325 Sacs and Foxes purchased land at Tama, Ia., in 1857, which they still occupy and manage with marked industry and intelligence. Settlements of Sacs and Foxes are found also in Kansas. Nebraska, and Oklahoma. The two tribes number about 1,000, and are among the most industrious and successful of their race.

Saddlery (*săd′lẽr-ȳ*), the general name applied to saddles and harnesses, and parts thereof, such as are offered for sale in a saddler's shop. Saddles were in common use among the Egyptians, but they were a part of the draft harness of the animal that bore the load, instead of being a seat upon the back for the rider. The ancients used a form of saddle or box for the back of the camel, which served both for riding and to contain merchandise and other commodities. Saddles were early padded, but trees came into use in Rome about the 4th century A.D., and stirrups began to be used in the 7th century. Sidesaddles date from the 12th century and are used by women.



HOW TO MEASURE A SADDLE

Both saddles and harnesses have differed materially under a variety of circumstances and in different countries. Among the principal parts of a saddle are the *tree*, the *seat*, the *panel* or *pad*, the *pommel*, the *skirts*, the *stirrups*, the *stirrup leathers*, and the *girth*.

Among the essentials of a modern harness are the *bridle*, either with or without blinders; the *collar*, which fits about the neck and shoulders; the *hames*, which fit to the collar; the *tugs*, forming the attachment between the hames and the load; and the *saddle*, which holds the lines, tugs, and reins in place. Harnesses are either single or double, depending whether they are to be used for a single horse or team. However, harnesses are also especially made for four, six, and eight horses.

Sadducees (*săd′ū-sēz*), the name of one of the chief Jewish parties or sects, the other being the *Pharisees*. They rose among the Jews in the 2nd century before Christ, taking their name from Zadok, a priest who declared in favor of Solomon. It is certain that they did not become a party as early as the time of Zadok, but it is thought that the early representatives were his descendants. All of them admired his fidelity to the theocratic government and, like all other Jews, admitted that the Mosaic law was given at Sinai by Jehovah in person. The Sadducees rejected the belief that an oral law of Moses had come from God, and would accept nothing beyond the written word, and so they came to hold three particular doctrines: (1) that all the law of God was given in a written form to Moses; (2) that there is no resurrection of the dead with attendant rewards and punishments in the future world; and (3) that there are neither angels nor spirits. Less numerous than the Pharisees, they included the more wealthy and aristocratic, and at one time almost monopolized the more honored places in the priesthood and the highest dignities. There was a marked decrease in their number in the 1st century and the sect eventually passed out of existence. Most of the information regarding the Sadducees is drawn from Josephus and the New Testament.

Sadi (*sȧ-dē′*), the name assumed by Sheik Muslih-ud-din, a celebrated didactic poet of Persia, born at Shiraz about 1184; died there in 1263. He was descended from Ali, son-in-law of Mohammed, but little is known of his early history. After studying science and theology at Bagdad, he made a pilgrimage to Mecca, and traveled extensively in Palestine, Syria, Hindustan, Egypt, and Eastern Europe. The Crusaders made him a prisoner and required him to work as a slave on the Tripolitan fortifications, but he was recognized by an Aleppo merchant, who ransomed him. Fully 50 years of his life were spent in traveling, in the course of which he made 14 pilgrimages to Mecca, but in the later part of his life he settled in his native town. Sadi delighted the people of his time not only by his writings in prose and verse, but also with numerous sage precepts, which he was able to give in many different languages. His "Gulistān," or "Garden of Flowers," counted his best writing, is a work in prose and verse that comprises anecdotes, stories, and numerous observations and reflections on morality. "Bustan," or "Tree Garden," is a collection of fables and histories, and "Pand-Nameh," or "Book of Instructions," is an elegant treatise on the duty of culture. It contains many maxims.

Sadism (*săd′ĭz′m*), a psycho-sexual perversion in which gratification depends upon the gratuitous infliction of pain upon a human, usually the object of desire, or upon an animal. In a subtler form, sadism also includes intellectual torture. The name derives from the French novelist, Donatien Alphonse François, Marquis de Sade (1740-1814), who describes such experiences in his novels.

Sadowa (*sä′dô-vä*), a village in Bohemia, on the Bistritz River, near Königgrätz. It is important as the scene of a decisive battle on July 3, 1866, in the Austro-Prussian War. The Austrian army of 220,000 was commanded by Gen. Benedek and the Prussian of 240,000, by King William I. The battle raged from 8 A.M. to 4 P.M., resulting in the defeat of the Austrians with a loss of 21,000 men and 22,000 prisoners, while the Prussians lost only 9,000. This battle is sometimes called Königgrätz, since the village of Sadowa is about 8 m. distant.

Safe (*sāf*), a steel receptacle for protecting valuables against burglars and fire. Documents and possessions of value were protected in ancient times by placing them in iron-bound oaken chests and in the charter rooms of old mansions, but these have given way to fire- and burglar-resistive safes of modern construction. The first patent on a fireproof safe was issued in 1801. Subsequently they were greatly improved, both in size and in the style of manufacture.

Fire-resistive safes are constructed of an inner and outer steel casing, the intervening space being filled with a scientifically developed heat-resisting insulation. Safes built before 1917 are considered obsolete; this conclusion was reached by the Safe Manufacturers Association after studying over 3,000 case records of safes in actual fires, in the records of the National Fire Protective Association. These safes were constructed of iron with the intervening spaces between the two casings insulated with the best-known fire-resisting material at that time, but this insulation, which was subject to deterioration, proved ineffective. Moreover, the weighty insulation made the safes extremely heavy, so that the cast-iron jambs frequently broke if the safe fell to a lower floor during a fire. Another disadvantage was that the heavy walls made the safes occupy too much valuable floor space for their limited inside capacity. With modern insulation, the intervening spaces have been considerably reduced, resulting in much lighter weight, greater structural strength, and greater interior capacity for the same floor space.

Modern safes, built entirely of steel, with no wood or cast iron used, are tested, approved, and labeled by the Underwriters' Laboratories for one, two, and four hours' fire-resistance, plus drop or impact and explosion test. They are fitted with adjustable and interchangeable metal filing units, thus permitting interior arrangements to meet individual requirements. These fire-resistive safes usually bear the underwriters' T-20 label indicating that the safes are capable of withstanding a concentrated attack of drills, sledge hammers, wedges, and mechanical tools used by burglars in opening safes.

Burglary-resistive safes. In fire-resistive safes, protection is afforded by the insulation referred to. Resistance against burglary is provided by the steel walls which, through case-hardenings and other approved methods of construction, provide an exceptionally hard surface to resist drills and a soft, tough core to resist explosives. Many such safes are cast in a single piece. Some are tested and approved by the Underwriters' Laboratories for not less than one hour resistance to burglary, including high explosives commonly used by burglars. These safes usually are equipped with an Underwriters' Laboratories relocking device for added protection against mechanical and explosive attack.

Such safes are of various weights, but to make

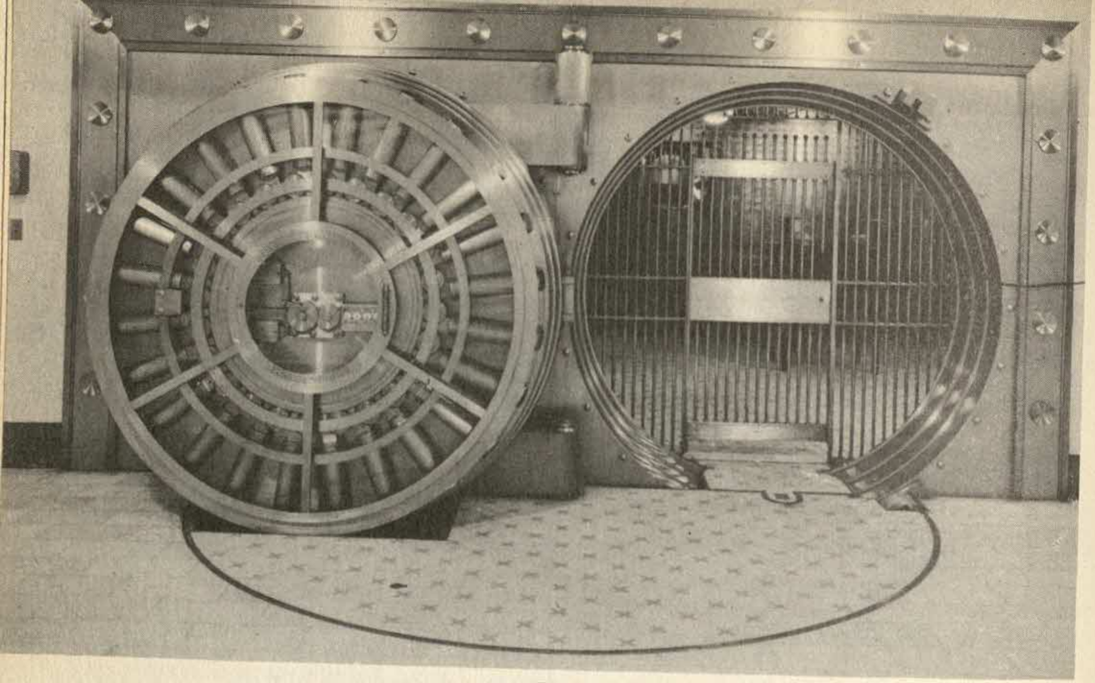


Photo by W. C. Persons, courtesy Mosler Safe Co., Hamilton, Ohio

VAULT DOOR EQUIPPED WITH FOUR MOVEMENT TIME LOCKS

them difficult for burglars to transport, they may be, when desired, anchored in heavy concrete steel-clad blocks without wheels, thus making burglarious transportation difficult, if not impossible, during the limited time in which a burglar normally has to operate. These safes are used by chain- and department-store organizations, and other branches of industry. Many users order the safes equipped with an inner "holdup compartment," have a dual-control lock, one key of which is retained on the premises, and the other key in the hands of a second person, usually a collector. Excess money may be deposited through a slot in the inner compartment; it then remains until removed by operation of the dual-control lock, thus thwarting the holdup bandit.

Burglary resistive safes used in banks and financial institutions, usually much larger than those described above, are highly resistant to burglarious attack with the specialized tools used by the modern bandit. These safes are generally equipped with multiple-movement time locks which hold the bolts in a locked position for a predetermined number of hours, in accordance with which the time-lock clocks have been wound. Time locks can be, and often are, applied to safes for commercial use.

In later years there has been developed, particularly for bank use, what is known as a delayed-action lock for use on safes, in which reserve cash is kept during banking hours. With these, the time lock is wound but remains inactive until an electric connection is applied to the door, using a specially designed device on the door. This connection causes the time lock to operate for a given period, relatively short in itself, but too long for the bandit to wait, since his activity is predicated on making a quick getaway.

Safe-Deposit Companies (*sāf-dē-pŏz'ĭt kŭm'pȧn-ĭz*). Safe-deposit companies are corporations that receive and keep money, stocks, jewelry, bullion, and other valuable property for depositors. This is an American enterprise, the first company having been chartered in New York in 1861, but now there are safe-deposit companies in practically all the cities of the world.

These companies provide strong burglary-resistive vaults constructed of steel plates and surrounded with reinforced concrete or equally resistant walls. The vaults are guarded by either round or rectangular doors of various thicknesses and construction. The resistance of the doors is equal to that of the walls. Such structures are as nearly burglarproof as modern science and ingeunity can devise. The doors are equipped with multiple-movement time locks which securely hold the locking bolts in position for a predetermined number of hours.

Safe-deposit vaults are equipped with *boxes* of various sizes, including large lockers for the accommodation of patrons who wish to store silverware and other bulky articles for safekeeping. These boxes are rented to individual users by the month or year. The boxes are usually equipped with dual-control locks requiring both the renter's key and the guard key to open the lock. Both keys are operated simultaneously. Neither key alone will open. The guard key is in possession of the bank and used in conjunction with the renter's key when the renter desires access to the box.

Vaults in the larger communities are usually guarded by armed watchmen during the day to prevent improper access by unauthorized persons. The vault custodian makes a complete record of each customer at the time the box is rented, and the customer must provide identification, through signature and often otherwise, before being allowed access to the vault for the purpose of gaining admittance to his safe-deposit box.

Customers are accorded the privilege of using private booths or rooms where the inner receptacle of the deposit box may be taken for the handling of the contents in complete privacy. These rooms are carefully checked by the custodian after each use to make sure that none of the contents of the box has been left in the room. Thus safe-deposit companies serve an important function in the safeguarding of valuables and important papers for their customers.

Safety Lamp (*sāf'tĭ lămp*), a device for giving light in mines. In the non-electrical form it is constructed so the flame does not cause an explosion in cases where fire damp prevails. Marsh gas is often freed in many coal mines and, when mixed with a quantity of air, it assumes a highly explosive form. Besides the danger incident to the explosion, there is further danger since an explosion always renders a large bulk of air unfit to support life. Sir Humphry Davy, in 1816, invented the first safety lamp, which depends upon the principle that flame does not pass through fine network of wire or gauze and that light and air do. The wires are usually not over one-fiftieth of an inch in diameter, and the apertures must not exceed one-twenty-second of a square inch.

There is a perceptible increase in the size of the flame when the lighted lamp comes in contact with the atmosphere mixed with fire damp, and the miner is thereby warned that danger is at hand. Although reasonably safe, and long the fundamental light source for mines, the Davy Lamp has been generally replaced by electric devices. In particular, the miner's cap lamp is a highly efficient incandescent light source operated by a battery attached to the miner's belt. To prevent explosions which might result if a hot filament came into contact with an explosive gas, the bulb is enclosed in a small, hard rubber case with a covering glass plate. If this is broken in any way, the lamp bulb springs out of its socket and is extinguished.

Safety Valve (*vălv*), a valve, usually circular in form, which is used on steam boilers to furnish protection against taxing them beyond their strength. Such a valve is kept in place either by a spring or by a weight, and is located at the side or in the top of a steam boiler. Most stationary engines have one valve of this kind, while locomotives are supplied with two. The valve is gauged at a certain point, depending upon the strength of the boiler or the pressure desired, and the steam escapes whenever the pressure exceeds the weight with which the valve is held. After the valve has been forced upward and the pressure on the boiler is relieved, it assumes its former place. The standard for determining the size of the safety valve is the grate surface, which should not exceed 2 sq. ft. of surface in the boiler to 1 sq. in. in the safety valve. Care should be taken that the valve is not fastened or loaded too heavily as compared to the strength of the boiler.

Safflower (*săf'flou-ẽr*), an annual plant of the *Compositae* family. It has an erect cylindrical stem from 1 to 2 ft. high, spiny leaves, and compact heads of flowers of a deep orange color. The stem is inclined to branch considerably. It is native to India, but has been naturalized in Egypt and the southern part of Europe, where it is cultivated extensively. The seed of the safflower yields an oil used extensively by the Asiatics as a laxative in medicine and as a lamp oil. Dyes obtained from this plant are derived from the leaves, which are picked by hand in dry weather and dried in a kiln. Both red and yellow coloring materials are obtained, but they are not valued highly for dyeing. The safflower is of economic value in making rouge, which receives its color from the coloring properties of this plant.

Saffron (*săf'rŭn*), an autumn-flowering species of crocus. It is often called the *autumnal crocus* to distinguish it from a species called spring crocus, which it closely resembles. The flowers of the plant yield the saffron of the market, which is used largely for coloring confectionery, liquors, medicine, and foodstuffs. It requires about 4,000 flowers to make an ounce of saffron. Formerly saffron was used as a dye material, for perfume, and as a medicine, but it has gone out of use for those purposes, except in parts of Asia. The saffron plant is cultivated extensively for its flowers in France, Spain, Italy, and western Asia.

Safranine (*săf'rȧ-nēn*), $C_{21}H_{20}N_4$, a red, basic dye compound obtained from aniline and toluidine mixtures by treatment with nitrous acid and subsequent oxidation. Aniline pink readily dyes animal fibers a saffron color. It is being replaced by benzidine-base dyestuffs. Other compounds related to the safranines are the induline and nigrosine dyes.

Saga (*sä'gȧ*), a "tale" or "something said." The word saga is applied most properly to the prose narrative literature of Iceland in the Middle Ages. The word is applied, by analogy, to similar literature of other Scandinavian countries: *e.g.,* the Norse *"Frithjofs-Saga,"* the Swedish *"Ingvars-Saga,"* and the Danish *"Knytlinga-Saga."* By more remote analogy, it is sometimes applied to the legendary and traditional literature of other countries and even to any very detailed and circumstantial narrative. It is in this last sense, for example, that John Galsworthy uses the word as the comprehensive title for his collection of novels about a single imaginary family: "The Forsyte Saga."

The first sagas of Iceland, some of which date from the 9th century but which were not recorded before the 12th century, were composed orally and were preserved in the memory by "saga-men," professional storytellers who provided entertainment for the wealthy and who for their talents were honored guests at banquets and festivals. Although some are frankly fictional, most of the sagas are accounts of the exploits of historical or pseudo-historical Scandinavian figures. One group of sagas is concerned with the careers of kings, frequently kings of Norway. Another group is concerned with Icelandic heroes. Among historical sagas, the *"Heimskringla,"* written in the 13th century by Snorri Sturluson, is outstanding. Among the sagas of legend or myth, the *"Volsungasaga"* is notable. Aside from their intrinsic literary value, the historical and legendary sagas are valuable sources for our knowledge of Scandinavian history and folklore. "Romantic sagas," which are late imitations of other literatures and which include tales of Charlemagne and of Arthurian knights, are less significant.

Not sagas, but related to them, are the two *"Eddas"*—the Poetical or Elder *"Edda"* and the Prose or Younger *"Edda."* The Prose or Younger *"Edda,"* to which alone the title is properly assigned, is the work of Snorri Sturluson, author of the *"Heimskringla."* The Younger *"Edda"* is in effect a reference book of Icelandic mythology and a handbook of poetic art. Its first section is a mythology, its second a discussion of the language and rhetoric of poetry, its third a description of various poetic meters; as a whole, it is a manual for young poets.

The Elder *"Edda"* is a collection of 33 poems dealing with Scandinavian myth and heroic legend, including lays of the Nibelungs. It was assigned the name *"Edda"* by its 17th-century discoverer because it contains material found also in the Younger *"Edda."*

Sage (*sāj*), an extensive genus of plants of the mint family, which are widely distributed in temperate regions, embracing 450 species. Most of these plants are perennials of a shrubby nature. They have greenish-gray leaves, yield bluish flowers, and grow to a height of about 2 ft. The *garden sage,* native to the southeastern part of Europe, is the best known. It is used extensively for flavoring meat, especially for dressing in poultry, and the leaves are employed in making a slightly stimulating tea. The *apple-bearing sage* is native to Crete, where the gallnuts are used in flavoring confectionery.

Sage, RUSSELL, capitalist, born in Oneida County, New York, Aug. 4, 1816; died July 22, 1906. After attending the public schools, he engaged in the wholesale grocery business at Troy (1839-57), was a member of Congress as a Whig (1853-57), and in 1863 moved to New York City, where he became associated with Jay Gould and acquired a fortune by speculating in railroad stocks. He promoted various telegraph and cable companies, and was an investor in the elevated railroad of New York City. An attempt was made to assassinate him in 1891 by means of a dynamite bomb, but he escaped uninjured, although his secretary was killed and one of his clerks received severe injury. His $70,000,000 fortune was left to his second wife, Margaret Olivia Slocum Sage. The latter became one of the most noted philanthropists of America. In 1907 she established the Russell Sage Foundation (*q.v.*) with a $10,000,000 endowment, to improve social and living conditions in the U.S.

Sagebrush (*sāj′brŭsh*), the general name for several kinds of plants belonging to the *Artemisia.* These plants are hoary underbrush and cover vast tracts of the western plains. Another plant of the plains, known as *Salvia,* is a true sage and belongs to the mint family.

Sage Grouse (*sāj grous*), the name of a species of grouse native to North America, so named from its habit of feeding upon sagebrush. The legs and feet are feathered to the toes, the tail is elongated, and the feathers have a brownish-yellow color. The male is larger than the female and has naked air sacs on each side of the neck. An average cock is about 30 in. long, while the hen ranges from 20 to 24 in. in length. The flesh is highly esteemed as food, but it is frequently tainted by a bitter flavor from the sagebrush, especially if the bird is not drawn as soon as shot. The sage grouse is found on the plains from British America to the northern part of Mexico, but is most abundant in the sagebrush region.

Saghalien (*sä-ḵä-lyēn′*). See *Saḵhalin.*

Saginaw (*săg′ĭ-nạ*), a city in Michigan, seat of Saginaw County, on the Saginaw River, 85 m. N.W. of Detroit. It is on the Grand Trunk, the Chesapeake and Ohio, and the New York Central R.R.'s. Two railroad and several other bridges span the river. Saginaw is situated in an agricultural area, producing primarily sugar beets. There are coal, graphite, petroleum, and salt deposits in the vicinity. The manufactures include automobiles and automotive equipment, machinery, furniture, and food and meat products. Formerly there were two towns—Saginaw City, chartered in 1857, and East Saginaw, chartered in 1859; they were consolidated in 1890. Population, 1950, 92,918.

Saginaw Bay (*săg'ĭ-nạ bā*), an inlet on the western side of Lake Huron, the largest and most important bay of the Lower Peninsula of Michigan. It has several fine harbors and valuable fisheries. The bay is 60 m. long and *ca.* 25 m. wide. It is the outlet for the Saginaw River, a stream formed by the Cass, Flint, Shiawassee, and Tittabawassee rivers. The Saginaw River is navigable by steamer for *ca.* 20 m., from its mouth to the city of Saginaw (*q.v.*).

Sagittaria (*săj-ĭ-tā'rĭ-ạ*), also called ARROWHEAD and SWAMP POTATO, a genus of herbs with arrow-shaped leaves, and flowers arranged in groups of three. There are several species, some of which are used in aquaria. The genus is found in tropical and temperate regions and is widely distributed in the U.S.

Sagittarius (*săj-ĭ-tā'rĭ-ŭs*), the sign of the zodiac into which the sun enters about Nov. 22. It is so named from the archer and is the ninth of the 12 zodiacal signs. The name is also applied to a constellation, which lies east of Scorpio and is visible in the southern U.S. in summer.

Sago (*sā'gô*), an article of food obtained from the inner portion of the bark of several species of palm trees. The sago-bearing palms thrive in the East and West Indies, the Bahamas, and New Guinea. They attain a height of from 20 to 35 ft. and a diameter of about 20 in. The trees are cut down at maturity to secure the medullary or inner part, which weighs from 150 to 700 lb. It is reduced to powder and formed into grains about the size of coriander seeds, or it is ground into a whitish powder called *sago meal*. The principal constituents are protein, 9 per cent; water, 12 per cent; and nitrogen-free extract (mostly starch), 78 per cent. In the countries where sago is produced it is used extensively as a staple food. Elsewhere it is eaten mainly as a delicacy. It is also employed as a starch for textiles and as an ingredient for making soluble cocoas.

Saguenay (*săg-ẹ-nā'*), a river of Canada, in the Province of Quebec. It is the outlet of Lake St. John, which it leaves by two channels that are later joined. Below the lake, it has a length of 110 m., flowing into the St. Lawrence about 115 m. N.E. of Quebec. There are many rapids in the upper course, and the river is characterized by fine scenery and precipitous cliffs. It is navigable to Ha Ha Bay for large vessels, and is used extensively for the transport of lumber. The town of Tadoussac, at the mouth, is a well-known summer resort.

Saguntum (*sä-gŭn'tŭm*), anciently an important city of Spain, *ca.* 15 m. N.E. of Valencia. A seaport in ancient times, it is now 3 m. from the Mediterranean, which has receded. The city was founded by Greek traders, under whose influence it rose to commercial importance, but it is noted in history particularly for the siege and battle fought here by the Carthaginians under Hannibal (*q.v.*) in 219 B.C. The siege extended over a period of eight months. After suffering from famine, the city made a heroic effort to repel the besieging army, but it failed, and the city, which was allied with Rome, was destroyed. This battle was the direct cause of the Second Punic War. At the beginning of the Christian era, Saguntum was a prosperous Roman town, and there are still many remains of this time, especially a theater. Between 713 and 1238 it was held by the Moors. The place was known, until 1877, by its medieval name of Murviedro, but was then renamed Sagunto. It suffered during the Peninsular War (1808-14). The end of the short-lived Spanish republic of 1873-74 was declared here, when Alfonso XIII was placed on the throne. The modern town is a trade center for agricultural products and manufactures linen and produces wine and other alcoholic beverages. Population, *ca.* 20,000.

Sahaptin (*sä-hăp'tĭn*), also called NEZ PERCÉ, a member of the main tribe of the Shahaptian linguistic family. The tribe was visited in 1805 by Lewis and Clark, who gave them the name Chopunnish. The Sahaptins roamed in western Idaho, northeastern Oregon, and southeastern Washington on the lower Snake River and its tributaries. For the most part they were friendly to the whites, and in 1855 a large part of their territory was ceded to the U.S. At the time of the 1860-61 gold rush in this region their reservation was reduced by a new treaty, which some of them did not recognize. Led by Chief Joseph, several hundred tribesmen resisted, starting the Nez Percé war of 1877. They inflicted several severe defeats on U.S. troops before being subdued. They were taken to Indian territory, but in 1885 the survivors were moved to the Colville reservation in Washington, where a few of their descendants still live. Those not involved in the revolt remained on the reservation in Idaho and currently number *ca.* 1,500.

Sahara (*sạ-hä'rạ*), a vast arid region of North Africa, the largest desert in the world. Although its boundaries are difficult to fix precisely, it may be said to extend from the Atlantic Ocean to the Nile Valley, and from the Atlas Mts. in the north to the Niger River and Lake Chad in the south. It also includes the regions known as the Libyan, Arabian, and Nubian deserts. The entire area is estimated at 3,500,000 sq. m., making it a region nearly as large as all of Europe. Nine-tenths of this desolate land of sand and rock is uninhabited; it consists of vast, wavelike plains of sand; regions of dunes both fixed and "alive" (moving under the action of the wind), some of which reach a height of almost 1,000 ft.; cliffs as high as 2,500 ft., extending for hun-

Courtesy French Embassy Press & Information Div.

DESERT TRAIL

An oil well in the heart of the Sahara Desert is reached by this trail laid out across the shifting sand dunes of Tiguentourine

dreds of miles and only occasionally broken by passes; and mountains containing peaks of more than 11,000 ft. In the central Sahara are the Ahaggar Mts.; in the south are the Tibesti, the Aïr, the Adrar des Iforhas, and the Adrar. Less than 500,000 acres are under cultivation in the oases, where irrigation from underground streams has extended the arable areas.

The climate is arid, with a temperature range from 133° to 11° F. The humidity is low, sometimes dropping below 10 per cent.

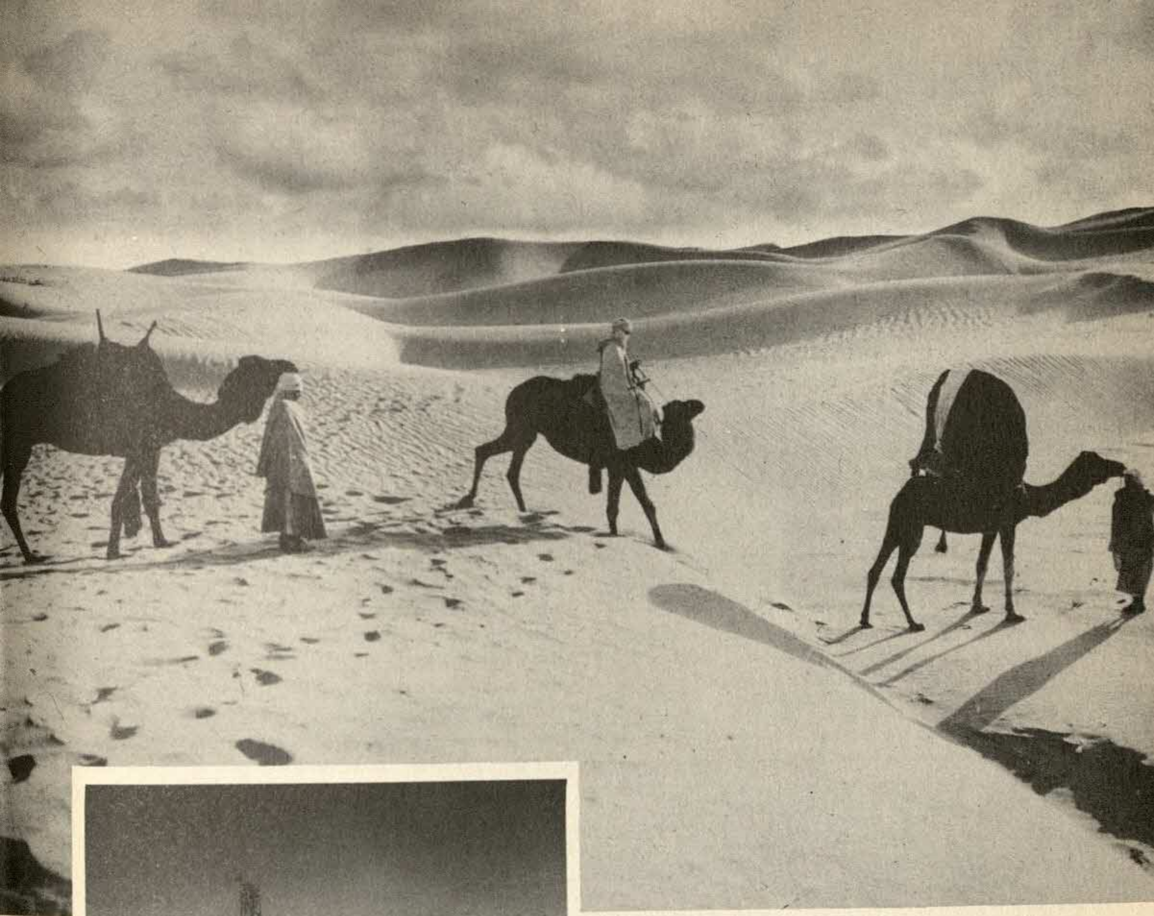
The population of the Sahara is settled mainly in the oases, except for a substantial proportion of nomads. The population is made up of racial groups of various origins, generally merged by intermarriage. It includes the Bedouins, nomadic Arabs; the Haratins, descended from Ethiopians; Negroes from the Sudan, brought in as slaves; the people of the Fezzan and the Tibesti Tubus, who can be traced back to the Sahara's prehistoric civilization; and the Berbers, including the Tuareg tribes.

Politically the Sahara is divided among France, Spain, Italy, and Great Britain, with parts lying in Libya, Egypt, Tunisia, Morocco, and the Sudan.

Recent exploration and research have uncovered evidences of a great prehistoric culture in the Sahara region—the Garamantes civilization described by Herodotus. Rock paintings left by prehistoric artists indicate a land of rivers and plains, populated by such tropical animals as the elephant, giraffe, rhinoceros, and hippopotamus, the game of a race of hunters. Gradually the climate transformed the face of the land. The rapid alternation of heat and cold between day and night (a difference sometimes of 60°) caused "desert weathering," a process in which the rock surface expanded rapidly during the daytime heat, cracking and crumbling into sand over the centuries. As the process of erosion proceeded, the rivers dried up into wadis, river beds containing moisture only after the meager rains. No permanent river or stream was left in the entire Sahara. The only areas of vegetation remaining were the oases, fed by underground streams. The animal life changed, the tropical fauna being replaced by such desert creatures as the camel and the gazelle. The human population also changed, first to pastoral tribes, later to warrior tribes as the land became ever more barren. As recently as the 1st century A.D., enough water remained to enable Roman legions to penetrate as far south as Lake Chad. By the early part of the 19th century, when European exploration of the Sahara began, the Arabs called the heart of the desert El Khela, "the Void," and the land was considered unreclaimable.

With 20th-century scientific advances and mechanization, however, a new era began in the Sahara. The primary discovery, on which all reclamation depends, was the existence of a great layer of water, called the Albian Sea, only about 1,300 ft. below the surface. This underground layer is constantly replenished by infiltration of rain water from the Atlas Mts. and the high plateaus. Second to the problem of water was the transportation of men and machines. As recently as the 1920's, camel trails were the only routes through the desert. Caravans took 50 days to make crossings. By 1958 five highways had been constructed, roughly north to south, across the heart of the Sahara, and automobiles and trucks could cross in three days. In addition, air service had been established to a number of the principal settlements. Problems of water supply hampered the early building of railroads. The Mediterranean-Niger R.R., planned to extend over 1,850 m., has been completed for only 375 m. The development of the Diesel locomotive, which does not require water, has led to proposals for continuation of the railroad project.

Geological exploration has revealed, in addition to the great Gara Djebilet iron deposits discovered in 1952, major deposits of coal, oil, natural gas, copper, and manganese. These natural resources were under exploitation in



SAHARA CONTRASTS

Despite the advances of modern engineering that have tapped the vast mineral resources of the desert, camel travel (*top*) is the mainstay of the native Berbers (*courtesy Ewing Galloway*). Oil exploitation (*above*) is part of a new era in the Sahara (*courtesy French Embassy Press & Information Div.*)

1959. The oil field at Hassi Messaoud was believed to contain 300,000,000 tons at a depth of 10,800 ft.; that at Ejele to contain 50,000,000 tons at a depth of only 1,476 ft. Pipelines for the transshipment of oil were partly completed and in operation in 1959, and were scheduled to extend to the coast at Bougie by 1960.

Recent discoveries in the field of solar energy promise to open up an entirely new source of power for Africa. The Sahara's nearness to the equator makes it a prime possibility for the development of solar energy, since the process is economical only where the angle of the sun's rays approaches the vertical. The use of solar energy was expected to transform the industrial and mining activities of the Sahara.

Saigon (*sī-gŏn′*) or SAIGUN, a city of Indo-China, capital and chief seaport of Viet Nam, on the Saigon River near its outlet into the South China Sea. It has sea, air, and rail facilities, and canal connections with the Mekong River. The principal trade is in rice, cereals, fruit, timber, fish, and salt. The city has a university, an art museum, botanical gardens, temples, and a Roman Catholic cathedral. Formerly the capital of Cochin China, Saigon was a French possession from 1862 until shortly after World War II, when the Republic of Viet Nam was established. The city suffered much

Courtesy French Embassy Press & Information Div.

SAIGON RIVER HOUSEBOATS

Families spend their lives in houseboat communities such as this one near Saigon, the principal seaport of Viet Nam

damage during the fighting with the French and, later, with the Communist forces of North Viet Nam. Population, *ca.* 1,800,000.

Saigo Takamori (*sī-gō tä-kä-mô-rē*), general and statesman, born in Satsuma, Japan, in 1827(?); died in Kagoshima, Sept. 14, 1877. As a member of the powerful Satsuma clan, he was an opponent of the shogun, or military dictator. Saigo led a force of soldiers in the fighting in 1868 that returned power to the emperor. Saigo held office in the new imperial government, but he was strongly opposed to the Westernization of Japan which was in full flood. In 1873 he resigned in protest against the decision not to attack Korea. In 1877 he led the Satsuma rebellion, but his samurai (*q.v.*) soldiers were overwhelmed by the force of modern arms. Saigo was killed in the battle.

Sail (*sāl*), a type of canvas cloth used to attach to a mast or a stay on a vessel. The purpose is to aid in propelling or moving the vessel in the water. Many kinds of material are employed in making sailcloth, but flax and hemp are used most generally. Cotton, jute, linen, and various vegetable fibers are utilized in making certain kinds of sails. Several breadths of canvas are necessary to construct a single sail. They are securely sewed together by a double seam, and a bolt rope is fastened around the edge by means of a strong cord.

The size of the sail depends upon the vessel, since larger vessels require a greater propelling force to move them in the water. Hence the size and strength of the sail are proportional to the size of the ship or boat on which it is to be used. It is possible to secure the greatest propelling power when the wind is right astern, but advantage may be gained when it is on either beam by dividing the sail into two parts, the one part acting to cause the vessel to move sideways, and the other having a tendency to propel it forward. Various other combinations are taken advantage of in placing the sails, which make it possible to gain a forward movement with a fairly unfavorable wind, though under such conditions it becomes necessary to have the vessel move in a zigzag course.

The two principal types are square sails and fore-and-aft sails. *Square sails* are four-sided. They are bent to a yard and are normally at right angles to the keel. *Fore-and-aft sails* are attached to a boom, gaff, or stay, and are normally nearly parallel to the keel. The upper edge of a sail is called the *head;* the lower edge, the *foot;* and the sides in most sails are known as *leeches.* The lower corners of a square sail are its *clews,* and the same name is applied to the lower after corner of a fore-and-aft sail. A *tack* is the lower forward corner of a fore-and-aft sail or the lower weather corner of a square sail, and the *earing* is the upper corner of the latter kind. Sailmaking was an important industry among the ancients and still continues to hold a place among industries, although sailing vessels have now almost disappeared from commercial use (except for fishing).

Sailboat (*sāl′bōt*), a water-borne vessel propelled by the driving power of the wind against sail (*q.v.*). The use of the sail probably dates back to prehistoric times when men learned that they could cross a body of water, if the wind was behind them, by holding up some object that would offer resistance to the force of the wind. The Egyptian sailing ship of 6000 B.C. had a single square sail, set at right angles to the keel on a mast either in the center or forward in the ship. This type of sail continued in use until, and even after, the development of the lateen or triangular sail, which was rigged more or less parallel to the keel. With the lateen sail came the development of sailing into the wind, and it was the forerunner of the various types of fore-and-aft rigging.

At the peak of the standard sailing ship's use, which began in the 15th century and continued until the development of steam power, there were two main categories of rigging, square rigging and fore-and-aft rigging, plus combinations of the two. The larger sailing ships carried three masts: the foremast, toward the bow of the ship; the mainmast, near the center; and the mizzenmast, toward the stern.

Among the principal square-rigged ships were the famous *clipper* (*q.v.*) of the mid-19th century, a full-rigged three-master that was the fastest vessel that ever sailed under canvas; the *bark* (*q.v.*), a three-masted vessel with foremast and mainmast square-rigged and mizzenmast fore-and-aft-rigged; the *barkentine*, a smaller version of the bark, with only the foremast square-rigged; the *brig*, a two-masted square-rigged vessel; and the *brigantine*, a smaller version of the brig, with a square-rigged foresail and fore-and-aft sails on the mainmast.

The *schooner* (*q.v.*) was the major representative of the fore-and-aft rigging. Typically carrying two masts (but occasionally three), it became the trademark of the Gloucester and Newfoundland fishing fleets.

The smaller sailboats commonly used for sport and pleasure boating are all fore-and-aft-rigged. Among the most popular are the *catboat*, a single-masted vessel with the rigging set as close to the bow as possible; the *sloop* and the *cutter* (*q.v.*), single-masters differing principally in that the sloop has one headsail and the cutter may have two or more; the *yawl*, which is rigged like the sloop with the addition of a small mast (mizzen or jigger) at the stern; and the *ketch*, similar to the yawl except that the mizzenmast is not so far to the stern. The term yacht, as applied to sailing vessels, may mean any type of ship, from small to large, used for pleasure or for racing. See also *Yachting*.

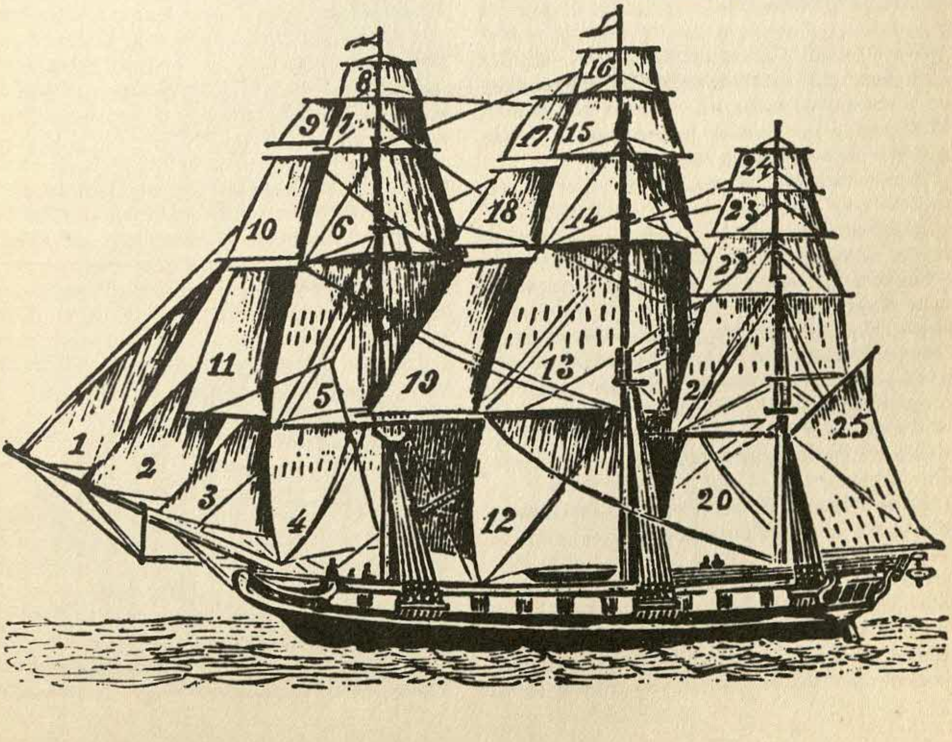
Sailing (*sāl′ĭng*), a method of driving a boat or ship forward by the use of sail (*q.v.*). Since the development of the steam engine and other forms of mechanical power, sailing has become almost obsolete as a means of locomotion, although it is still popular as a sport.

The use of the sailing boat or ship has been known for thousands of years, but in ancient times the only method of using wind power was by sailing before the wind, or running; *i.e.*, using the force of the wind against a sail set at right angles to drive a boat in the direction the wind is blowing. The real art of sailing began to develop when men learned to sail into the wind, or against the way it was blowing, thereby enabling them to be more or less independent of wind direction.

A FULL-RIGGED SAILING SHIP

The numbered sails are named as follows: (*1*) flying jib; (*2*) jib; (*3*) foretop-mast-stay sail; (*4*) fore-course; (*5*) foretop sail; (*6*) foretop-gallant sail; (*7*) fore-royal; (*8*) fore sky sail; (*9*) fore-royal studding sail; (*10*) foretop-gallant studding sail; (*11*) foretop-mast studding sail; (*12*) main-course; (*13*) maintop sail; (*14*) maintop-gallant sail; (*15*) main-royal; (*16*) main sky sail; (*17*) main-royal studding sail; (*18*) maintop-gallant studding sail; (*19*) maintop-mast studding sail; (*20*) mizzen-course; (*21*) mizzen-top sail; (*22*) mizzen-top-gallant sail; (*23*) mizzen-royal; (*24*) mizzen sky sail; (*25*) mizzen-spanker

Courtesy King Features Syndicate, Inc.



The usual method of sailing into the wind is by tacking, or sailing a zigzag course back and forth across the course desired. When the boat is on either the left or right tack (port or starboard, respectively), the wind strikes the sails at an angle, driving it off course but still forward. By alternating the tack, the boat makes steady progress forward.

When a sailboat is made to change its tack, it is said to come about; the steersman heads the bow directly into the wind and then over to the opposite tack. In the period when the bow heads into the wind, the sails take no wind and the boat moves forward solely by momentum. If this momentum is lost, the boat slows to a stop and is out of control, since steering is possible only in a moving vessel.

Sainfoin (*săn'foin*) or ESPARSETTE, a perennial herb belonging to the bean family. Resembling clover, it is widely grown in European pastures.

Saint (*sānt*), a title used in certain religions to designate any person who is remarkable for the practice of all the virtues. Usually, as in the Roman Catholic Church, it refers to a deceased person who in the course of time and by reason of the memory of his good repute is regarded as having been received into the company of God. The title is conferred only after exhaustive examination of the writings and deeds of the person. Sainthood is achieved in three stages: (*1*) after careful scrutiny of the person's life, he is called "Venerable"; (*2*) after all possible examination has been made, he is called "Blessed"; and (*3*) after proof that miracles have been performed through his intercession, he is solemnly proclaimed "Saint." The Roman Martyrology, an official publication in Latin, contains the names of the saints.

Oriental scholars, particularly those of Hindu and Tibetan lore, use the word saint in connection with Oriental holy men to indicate the repute they enjoy among their people. There is a fundamental difference, however, between the saint of the Catholic religion and of the Oriental. Orientals do not pray to their saints. Catholic saints are venerated and prayed to as the eternal friends of God, able to intercede for people on earth, although they are not worshiped as gods or the equals of God. For articles on individual saints, see under proper name, *e.g., Augustine; Christopher,* etc.

Saint Albans (*sânt ạl'bạnz*), a city in Vermont, seat of Franklin County, 25 m. N.E. of Burlington, on the Central Vermont R.R. The site is 2 m. from Lake Champlain, on an elevation of 388 ft., within sight of the Green and Adirondack Mts. The surrounding country is fertile, producing cereals, fruits, and vegetables. Among the industries are creameries, a cheese factory, railroad shops, and the production of maple sugar. Saint Albans was incorporated as a city in 1897. Population, 1950, 8,552.

Saint Albans, a city in England, in Hertfordshire, about 20 m. N.W. of London. Among the manufactures are silk and other textiles, earthenware, and machinery, and there are a number of iron foundries. The city is noted particularly for the Benedictine abbey founded here by King Offa of Mercia in 795. The abbey church was made a cathedral in 1877. It has the longest Gothic nave in Europe. Two battles were fought at St. Albans in the Wars of the Roses, in 1455 and 1461. Population (est.), 1957, 47,290.

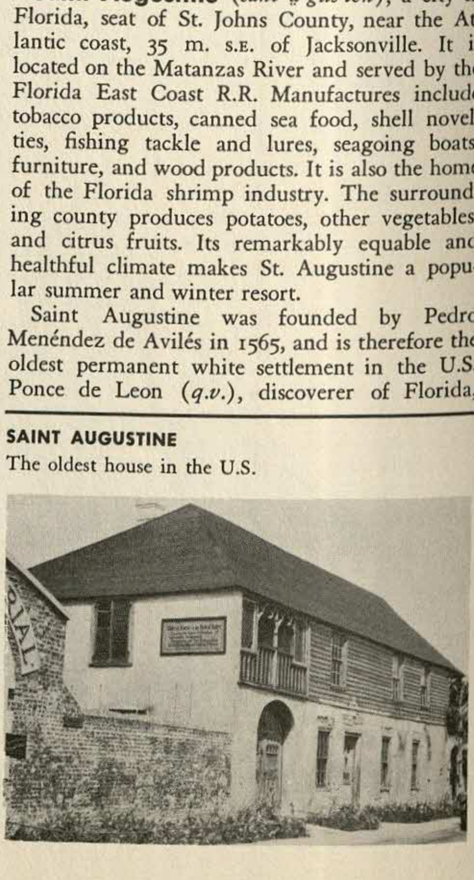
Saint Andrews (*sânt ăn'drōōz*), a town in Scotland, in Fifeshire, 12 m. S.E. of Dundee. It is a seaport of the North Sea and has railroad facilities. It is the seat of the Univ. of St. Andrews, founded in 1411, the oldest university in Scotland, in connection with which are a museum, a botanical garden, and a large library. It is also the site of a noted golf club, which is the governing power in golf and drew up the original rules. Population (est.), 1957, 9,559.

Saint Augustine (*sânt ạ'gŭs-tēn*), a city in Florida, seat of St. Johns County, near the Atlantic coast, 35 m. S.E. of Jacksonville. It is located on the Matanzas River and served by the Florida East Coast R.R. Manufactures include tobacco products, canned sea food, shell novelties, fishing tackle and lures, seagoing boats, furniture, and wood products. It is also the home of the Florida shrimp industry. The surrounding county produces potatoes, other vegetables, and citrus fruits. Its remarkably equable and healthful climate makes St. Augustine a popular summer and winter resort.

Saint Augustine was founded by Pedro Menéndez de Avilés in 1565, and is therefore the oldest permanent white settlement in the U.S. Ponce de Leon (*q.v.*), discoverer of Florida,

SAINT AUGUSTINE

The oldest house in the U.S.



landed in the vicinity in 1513. The city contains many historic monuments, including the Castillo de San Marcos, the oldest existing masonry fort in the U.S.; the old city gates; the Shrine of Nuestra Señora de La Leche, the site of the first Mass in 1565; and many other buildings dating back to Spanish colonization. Population, 1950, 13,555.

Saint Bernard (*sânt bĕr-närd′*), one of the largest breeds of domestic dog, named for the hospice of St. Bernard in the Alps of Switzerland, where it has been bred for many centuries. The dogs became famous for their rescue work in the Alpine passes, where they accompanied the monks of the hospice in search for travelers lost in the mountains. There are two types of St. Bernard, the smooth-coated variety with short, thick hair, and the rough-coated dog with longer hair. The male dog measures 27 in. or more at the shoulder and weighs from 150 lb. to 250 lb. In coloring the St. Bernard may be white with large red or brindle markings, or red or brindle with large white markings; the face is usually white with black markings.

GREAT SAINT BERNARD HOSPICE

Courtesy Swiss Federal Railroad

Saint Bernard Pass (*sânt bĕr-närd′ päs*), the name generally applied to two passes of the Alps, known individually as Great St. Bernard and Little St. Bernard. *Great St. Bernard* is on the east side of Mt. Blanc, in the Pennine Alps, between the canton of Valais, Switzerland, and the department of Piedmont, Italy. It is 8,111 ft. high, and near its highest part is the famous hospice founded by St. Bernard de Menthon, in the 10th century, as a refuge for those crossing the Alps. The pass is covered with snow nine months of the year, and the monks of the hospice keep a number of St. Bernard and Newfoundland dogs to aid in rescuing those in danger or distress from cold. Among the famous armies that traversed this pass were that of the Romans, that of Charlemagne, that of Frederick Barbarossa, and that of Napoleon when invading Italy in 1800. *Little St. Bernard* is south of Mt. Blanc, crossing the Graian Alps from the Isère Valley, in France, to the Dora Baltea Valley, in Italy. It is 7,177 ft. high. Near its summit is a hospice, founded by St. Bernard de Menthon.

Saint Boniface (*sânt bŏn′ĭ-fās*), a city in Manitoba, on the Red River, opposite Winnipeg, and on the Canadian Pacific and other railroads. It has meat-packing plants, oil refineries, and flour and rolling mills. It is the seat of St. Boniface Coll., a unit of the Univ. of Manitoba, and is a Roman Catholic archiepiscopal see. It is connected by several bridges with Winnipeg. Population, 1956, 28,636.

Saint Catharines (*sânt ḳăth′ẽr-ĭnz*), capital of Lincoln County, Ontario, 12 m. N.W. of Niagara Falls, on the Canadian National and other railroads. It is on the Welland Canal and is noted for its marine hospital and artesian mineral wells. The manufactures include cotton and woolen goods, flour and machinery. It is a port of entry. Population, 1956, 39,415.

Saint Charles (*sânt chärlz′*), a city in Missouri, seat of St. Charles County, on the Missouri River, *ca.* 22 m. N.W. of St. Louis. It is on the Wabash and the Missouri-Kansas-Texas R.R.'s. Railroad and highway bridges cross the river here. Manufactures include railroad cars, shoes, clothing, flour, and dairy products. Lindenwood Coll. and a Sacred Heart convent are located here. The earliest permanent settlement on the Missouri, St. Charles was settled in 1769; it was the state capital from 1821 to 1826. Population, 1950, 14,314.

Saint Christopher (*sânt ḳrĭs′tô-fẽr*), an island in the British West Indies. See *Saint Kitts.*

Saint Clair (*sânt ḳlâr*), a river and lake of North America, which form a part of the boundary between the State of Michigan and the Province of Ontario. The St. Clair River flows from Lake Huron into Lake St. Clair. It is about 40 m. long and half a mile wide and is of vast importance in the navigation of the Great Lakes. A railroad tunnel extends under it from Port Huron, Mich., to Sarnia, Ont., for a distance of 11,550 ft. Lake St. Clair receives the water from the St. Clair and the Thames rivers, and its surplus flows through the Detroit River into Lake Erie. It is 30 m. long, about 25 m. wide, and has an area of 360 sq. m. Within it are several islands, and it has excellent fisheries. The surface is 575 ft. above sea level.

Saint Cloud (*sânt ḳloud*), a city in Minnesota, seat of Stearns County, 65 m. N.W. of St. Paul on the Mississippi River. It is on the Great Northern and Northern Pacific R.R.'s, has an abundance of water power, and is surrounded by a farming and stock-raising region. Among the chief buildings of the city are the St. Cloud State Coll., a veterans' hospital, and the state reformatory. Just outside the city are granite quarries, which rank second only to Barre, Vt., as producers of this building material. The manufactures are lumber products, flour, granite monuments and building stone, frozen-food cabinets and household appliances, canned foods, valves and fittings, paper, floor sanders, poultry food, and dairy products. A stage stop before its permanent settlement, St. Cloud was settled in 1853 and incorporated in 1868. Population, 1950, 28,410.

Saint Crispin (*sânt ḳrĭs′pĭn*), a Christian martyr of the 3rd century, patron saint of shoemakers. His day is Oct. 25.

Saint Croix (*sânt ḳroi*), a river of North America, its length of *ca.* 75 m. forming part of the international boundary between Maine and the Canadian province of New Brunswick. Rising in the Chiputneticook Lakes, Maine, it flows southeast to Passamaquoddy Bay, past Vanceboro, Woodland, Calais, and St. Stephen. Partly navigable, it is used primarily for shipping lumber.

Saint Croix, a river in Wisconsin. Rising in several lakes in the northwestern part of the state, it flows 164 m. southwest to join the Mississippi River at Prescott, Wis., forming part of the Wisconsin-Minnesota boundary for most of its course. It is navigable for *ca.* 50 m. to its rapids in Interstate Park (see *Dalles*).

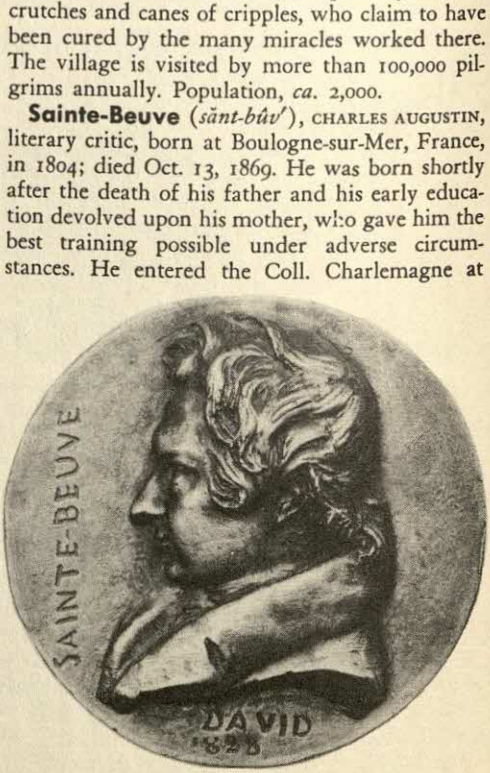
Saint-Cyr-l'École (*săn̲-sēr′ lā-ḳôl′*), a town in France, 3 m. w. of Versailles. In 1684 a school for girls was founded here by Mme. de Maintenon (see *Maintenon, Marquise de*). The school was suppressed during the French Revolution, but the building later housed the famous military academy which Napoleon I established in 1808. The building was destroyed in 1944 during World War II. Population, 1954, 7,368.

Saint-Cyr (*săn̲-sēr′*), MARQUIS LAURENT DE GOUVION, marshal of France, born in Toul, France, April 13, 1764; died in Hyères, March 17, 1830. He studied art, but abandoned this for a military career, entering the army in 1792. From 1796 to 1800, holding positions of command, he served in the Rhine campaign and in Germany and Italy. In 1801 he became ambassador to Spain and, two years later, returned to the army. He served in Italy, Prussia, Poland, and Catalonia, resigning subsequently in protest over certain orders from headquarters. Recalled to military service (1811), he took part in the invasion of Russia in 1812. His victory at Polotsk, on Aug. 18, led to his being made a marshal. Following Napoleon's overthrow, he adhered to the new regime and was minister of war in 1815 and again in 1817-19. In 1817 he was made a marquis. His memoirs provide interesting commentary on the Napoleonic Wars.

Saint-Denis (*săn-dē-nē′*), a city of France, 4 m. N. of Paris, with which it is connected by railway and rapid transit lines. It has canal connections with the inner harbor of Paris, and contains numerous buildings of historic interest. The famous Abbey of St. Denis was completed under Philip the Bold and was long the burying place of French kings. Louis XII caused mausoleums to be built with figures of the princes buried here and monuments were added by all the monarchs up to Henry II. Napoleon founded a school for daughters of the members of the Legion of Honor in the monastery, which still flourishes, and Louis XVIII improved the museums and added numerous monuments. St. Denis is at present one of the most beautiful and scenic cities of France. It has many fine buildings and gardens. The principal manufactures include leather, flour, sailing vessels, railway cars, engines, chemicals, textile fabrics, and machinery. The city was so named from the abbey founded by Dagobert on the burial place of St. Denis, the apostle of Paris. Population, 1946, 69,939.

Sainte-Anne-de-Beaupré (*sânt-ăn′-dē-bô-prā′*), a village of Montmorency County, Quebec, in which Breton sailors, grateful for escape from shipwreck, established a shrine about 1620. The Church of Ste. Anne is the repository for the crutches and canes of cripples, who claim to have been cured by the many miracles worked there. The village is visited by more than 100,000 pilgrims annually. Population, *ca.* 2,000.

Sainte-Beuve (*sănt-bûv′*), CHARLES AUGUSTIN, literary critic, born at Boulogne-sur-Mer, France, in 1804; died Oct. 13, 1869. He was born shortly after the death of his father and his early education devolved upon his mother, who gave him the best training possible under adverse circumstances. He entered the Coll. Charlemagne at



Courtesy Metropolitan Museum of Art, N. Y.

CHARLES AUGUSTIN SAINTE-BEUVE

Medal by David d'Angers (1788-1856)

Paris in 1818 and, after studying medicine for some years, took up a literary course. In 1840 he became keeper of the Mazarin Library, a position that made it possible for him to devote himself to literary criticism and to writing for the *Constitutionel.* His most important writings include a review of Victor Hugo's "Odes and Ballads" and the 28 volumes embraced in his "Monday Talks." The latter comprises the contributions published in the *Constitutionel* on Mondays.

Saint Elias (*sânt ê-lī'ạs*), MOUNT, a mountain of North America, situated near the boundary between Alaska and British America, rising 18,100 ft. above sea level. It was long thought that Mt. St. Elias was the highest mountain peak of North America, but Mt. McKinley is now so regarded, its peak towering 20,464 ft. above sea level. Glaciers move from the perpetually snow-covered sides of St. Elias and have worn precipices and chasms in their course to the Pacific. It is an important landmark, as it is completely isolated from other great peaks. The foothills have forests up to a height of 2,000 ft., but the mountain itself is barren.

Saint-Étienne (*săn-tâ-tyĕn'*), a city of France, in the department of Loire, of which it is the capital. It is situated on the Furens, a tributary of the Loire, about 30 m. s.w. of Lyons, and has railway connections with other cities. The churches of St. Etienne and Notre Dame are noteworthy. It has a school of fine arts, several industrial schools, a museum, and a well-organized public school system. Its importance as a manufacturing center is due to the water power drawn from the Furens River. Among the products are firearms, cutlery, steel, engines, railway cars, earthenware, and machinery. Its ribbon trade is said to be the largest in the world and it gives employment to 45,000 weavers. It has export trade in merchandise, coal, and clothing. Population, 1946, 177,966.

Saint-Évremond (*săn-tâ-vr'-môn'*), SEIGNEUR DE, author, born in St.-Denis, France, Apr. 1, 1613; died Sept. 29, 1703. He was descended from a noble family of Normandy and, after studying under the Jesuits, entered the military service, taking part in the Battles of Freiburg, Rocroi, and Nordlingen. Later he took up writing but a witty essay on a treaty made between Normandy and England compelled him to seek safety in flight to Holland and later to London, England, where he spent the later years of his life. He was a personal friend of Charles II and other distinguished men of England. Many of his essays, comedies, and letters are counted among the masterpieces of the latter part of the 17th century. An edition of his collected works was published in 1804.

Saint-Exupéry (*săn-tāg-zü-pā-rē'*), ANTOINE DE, aviator and author, born in 1900 in Lyons, France; announced missing over Southern France on Aug. 9, 1944. He fought in World War I, but did not begin to fly until after it. As a commercial pilot, he flew the mail from Toulouse, France, to Dakar, Africa, and then managed a French desert airdrome at Rio del Rio on the west coast of Africa. In 1929, he became manager of Aero Posta, an Argentine airline, for which he established an air-mail run, and then returned to France to fly the mails between France and the desert again. He joined the French air force at the beginning of World War II, escaping to join the Allies after the fall of France. Until 1944, he was a flight instructor but in that year he was transferred to reconnaissance and flew only a few missions before he was reported missing.

He is better known as a writer than as a flier, however. He is the author of four books about flying. Two of them are novels, "Night Flight," a story of the men who fly the night mails (1932), and "Southern Mail" (1933). "Wind, Sand, and Stars" (1939) is the story of his desert flying experiences and "Flight to Arras" (1942) is the story of his last reconnaissance flight before the fall of France. In 1943, he wrote and illustrated a children's book, "The Little Prince."

Saint Francis (*sânt frăn'sĭs*), the name of two rivers in North America, one in the U.S. and the other in Canada. The former rises in southeastern Missouri, has a general course of 450 m. toward the south, and flows into the Mississippi near Helena, Ark. It forms a part of the boundary between Missouri and Arkansas and is navigable for 150 m. In several places it expands into long lakes, thought to be due to sinking of the soil as a result of the earthquake in 1811. The St. Francis River of Canada is one of the important tributaries of the St. Lawrence. It rises in St. Francis Lake, in southeastern Quebec, and after a course of 120 m. enters the St. Lawrence near Lake St. Peter.

Saint-Gall (*săn-găl'*), a city of Switzerland, capital of a canton of the same name, 6 m. s.w. of Lake Constance. It is connected with other cities of Europe by railway and has a considerable trade. The noteworthy buildings include the museum of natural history, and the Roman Catholic cathedral. Among the manufactures are textile fabrics, chemicals, clothing, and machinery. It was so named from a convent founded here in the 7th century. It has been a part of the Swiss Confederation since 1803. Population, *ca.* 75,000.

Saint-Gaudens (*sânt-gạ'dẹnz*), AUGUSTUS, American sculptor, born in Dublin, Ireland, Mar. 1, 1848; died Mar. 1, 1907. He was brought to New York City at the age of six months. After attending the public schools, he studied drawing at the Cooper Inst. and in 1867 went to Europe, where he studied art in Paris and Rome. His first work of note was "Hiawatha," which he

Courtesy Metropolitan Museum of Art, N. Y.

AUGUSTUS SAINT-GAUDENS

Painting by K. Cox (1856-1919)

completed in 1871 while at Rome. He returned to New York in 1872, and in 1893 served as a juror of acceptance in the sculpture department of the Columbian Exposition. Among his principal works are his statues of Abraham Lincoln, in Chicago; Adm. Farragut, in New York; and Robert E. Randall, at Sailors' Snug Harbor, New York. He also created a fine statue called "Diana" and the nameless hooded figure sometimes called "The Peace of God," for the grave of the wife of Henry Adams (*q.v.*), in Rock Creek Cemetery, in Washington, D.C. His portrait busts include those of Theodore D. Woolsey, William M. Evarts, and William T. Sherman. Other works include the equestrian statue of Gen. Logan, in Chicago; the equestrian statue of Gen. Sherman, in the Plaza, New York; the Shaw Memorial, in Boston, Mass.; the monument of Peter Cooper, in New York; and the figure called "The Puritan," in Springfield, Mass. See also *Lincoln, Abraham.*

Saint George's Channel (*sânt jôr′jęz chăn′ęl*), the body of water which connects the Irish Sea with the Atlantic Ocean and separates the southern part of Ireland from Wales. It is about 100 m. long and from 60 to 95 m. wide. The depth ranges from 300 to 500 ft.

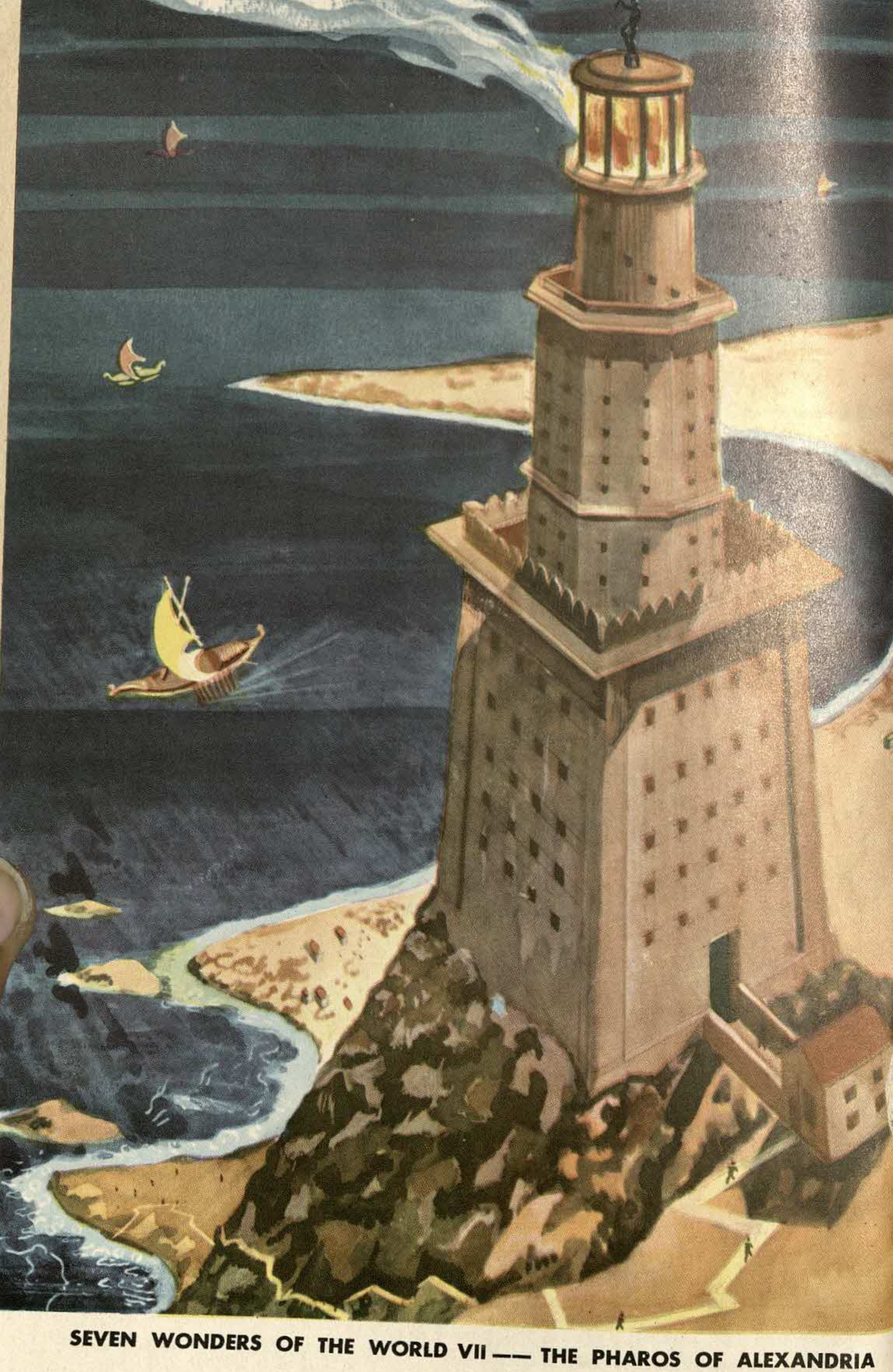
Saint-Germain (*săn-zhâr-măn′*), a town of France, on the Seine River, 7 m. w. of Paris. It is famous for the royal castle that served as a residence for the kings of France until the reign of Louis XIV, who moved the court to Versailles. The place is noted for its many fine monuments, including one erected by George IV over the remains of James II of England, who was an exile in the town. It is the seat of a number of monasteries and several convents. A terrace was built along the river front in 1672, and near the town is a splendidly preserved forest of 10,000 acres. The city has railroad connections and manufactures of various kinds. Near it are fine orchards. Population, 1954, 29,429.

Saint Gothard (*sânt gŏt′ẽrd*) or SAINT GOTTHARD. See *Gothard.*

Saint Helena (*sânt hĕ-lē′nȧ*), British insular possession in the South Atlantic Ocean, 1,200 m. w. of Africa, 700 m. S.E. of Ascension Islands, the nearest land. It has precipitous shores and a mountainous surface. The area is 47 sq. m. The island is of volcanic origin, forming the summit of a former volcano of a submerged region. Diana's Peak is the highest elevation, 2,750 ft. high. A small portion of the surface is susceptible to cultivation and is utilized in the culture of vegetables and fruits. Whale and other fisheries comprise the principal industry. It had a considerable commerce before the Suez Canal was opened to traffic, but at present the trade is principally in fish, which are exported. The imports are articles of food and clothing.

St. Helena was discovered by the Portuguese in 1502, but it became a British possession in 1651. The island is noted as the place at which Napoleon

SEVEN WONDERS OF THE WORLD VI —— THE COLOSSUS OF RHODES



SEVEN WONDERS OF THE WORLD VII —— THE PHAROS OF ALEXANDRIA was exiled after his final defeat at Waterloo, in 1815, and he died there in 1821. He made his home with a farmer named Longwood, and his remains were buried there, but the body was removed to France in 1840, and the Longwood Farm was purchased by the French government in 1858. Gen. Piet Cronje was held there in exile by the British for some time after his capture in the Boer War of 1899-1901. Jamestown, the capital, is the only port and is connected with Europe and South Africa by a cable. Population, *ca.* 4,500. See also *Abdication.*

Saint Helens (*sânt hĕl'ẹnz*), a city in Lancashire, England, 12 m. N.E. of Liverpool and 31 m. from Manchester. It is situated on the eastern edge of Lancashire's chief coal-producing area, and its population includes many miners. The town is served by the London, Midland & Scottish and the London & North Eastern R.R.'s, and a canal connects it with the Mersey River. Among its principal features are the public library, the town hall, Victoria Park, and a municipal technical college. The principal manufacture is glass, but the town also makes iron, copper, lead, chemicals, and bricks. In recent years there has been a marked industrial decline with steadily decreasing employment. Contributing largely to this has been the introduction of mechanization and the relative exhaustion of the Lancashire coal fields. The Merseyside Plan, published by the British government in 1945, has been projected to attract new industries and to provide the city with good housing and other improvements. Population, *ca.* 100,000.

Saint Hyacinthe (*sânt hī'ȧ-sĭnth*), capital of St. Hyacinthe County, Quebec, 35 m. N.E. of Montreal. It is on the Yamaska River and the Canadian National, the Canadian Pacific, and other railroads. The chief buildings include the county courthouse, St. Hyacinthe Coll., and a Dominican monastery. It has manufactures of hosiery, boots and shoes, leather, woolen goods, and machinery. The inhabitants are chiefly French Canadians. Population, *ca.* 12,500.

Saint Jean (*săn zhän*), or ST. JOHN's, capital of St. John's County, Quebec, 25 m. S.E. of Montreal, on the Richelieu River, opposite Iberville. It manufactures sewing machines, furniture, brick, and machinery. The chief buildings include the courthouse, postoffice, and Coll. Le Monnoir. The place was settled in 1748. Population, *ca.* 12,500.

Saint John (*sânt jŏn*), a river of North America, which rises in eastern Maine. After flowing northeast for some distance, it makes a bold curve and flows toward the southeast, entering the Bay of Fundy. The tributaries include the Big Machias, Aroostook, Allegash, and Tobique Rivers. The entire course is 450 m., of which 150 m. are navigable. It forms the boundary between Maine and New Brunswick nearly to Grand Falls, below which it flows through New Brunswick.

Saint John, capital of St. John County, New Brunswick, is one of the great national ports of Canada. It is on the Bay of Fundy and St. John River, and is the eastern terminus of the Canadian Pacific and one of those of the Canadian National R.R. It is the commercial and financial center of the province. The harbor is open the year round, is deep and safe, being protected by a breakwater and Partridge Island, which has a lighthouse and quarantine hospital. The port is equipped with modern machinery for the efficient handling of cargo and has one of the largest drydocks in the world. There is steamship service to the principal ports of the world. Two bridges span the river. The site rises rapidly from the harbor and is chiefly rocky and undulating. It has an extensive trade in lumber, fish, merchandise, and manufactures and is the largest manufacturing city in the Maritime Provinces. Chief industrial products include structural steel, shipbuilding, metals, brushes, lumber, refined sugar, textiles, clothing, cured and smoked fish, pottery, packing-house products, chemical fertilizers, pulp, paper boxes, flavoring extracts, spices, axes and edged tools, vinegar and pickles, brewed beverages and ales, roofing felts and paper, cement blocks and wood products. Noteworthy buildings include the St. John General Hospital, New Brunswick Museum, the Masonic Temple, the Odd Fellows' Hall, the Provincial Hospital for Nervous Diseases, and many fine churches. It has trolley and bus transportation systems. The site on which the city stands was discovered by Samuel de Champlain on June 24, 1604, and was first settled in 1635. It was long a point of contention between the French and English. The modern city was founded on May 18, 1783, with the arrival of some 3,000 United Loyalists from the New England States. The city was incorporated by royal charter on May 18, 1785, being the first incorporated city in Canada. Population, *ca.* 60,000.

Saint John of Jerusalem, KNIGHTS OF, an association of a military and religious character founded at Jerusalem in the Middle Ages. The merchants of Amalfi obtained permission, in 1023, from the Caliph of Egypt to found an institution in Jerusalem for the care of poor and sick pilgrims. Its fame was spread throughout Europe by grateful travelers, who recommended it to those wishing to see the Holy City, and many sent contributions to improve and enlarge its capacity. Although it had a humble beginning, it became a highly successful institution and was the direct cause of founding the Order of St. John. When Jerusalem was taken by the Crusaders under Godfrey de Bouillon, his soldiers were attended in the Amalfi Hospital of St. John under the direction of its rector, Peter Gerard. A regularly constituted religious body was formed under the rector, which received the approval of Pope Paschal II in 1113, and soon after commanderies were established in many Mediterranean towns to protect pilgrims as they passed to and from Jerusalem, and these in time became known as *Hospitalers*.

The order grew in military and aristocratic power for a century, but in 1289 an Egyptian force was sent to besiege Acre. It was the only remaining Christian seat of influence in Palestine, and it fell soon after. The knights sailed to Cyprus in 1291 and vainly tried to re-establish a foothold in Palestine, but they were finally compelled to abandon the project and, instead, undertook the conquest of Rhodes, which was taken in 1310 along with a number of other islands. For more than 200 years they maintained themselves against repeated attacks of the Turks, but the fall of Constantinople gave the Mohammedans material advantage and Sultan Suleiman finally captured Rhodes in 1523.

The homeless knights were provided for by Emperor Charles V, of Germany, who ceded to them the islands of Malta and Gozo and the fortress of Tripoli in Africa, but they never regained their former importance. However, the powerful fortress of Malta became the bulwark of Christendom and its name was assumed by the order, which became known as the Knights of Malta. In 1551 the Turks conducted a fruitless attack on the island and made a second attack in 1565. The defense under the grand master, Jean Parsiot de la Valette (1494-1568), forced the besiegers to retire. A crushing blow came in 1792, when the directory of France decreed that the order should be abolished, because it had become an asylum for French refugees. Malta was forcibly seized by the French in 1798, since which time the order has been divided by factions. Several branches are still in existence in Europe, including the German and Italian leagues and the Johanniter. The Hospitalers wore a red coat and adopted a Maltese Cross as their badge.

Saint John's (*sânt jŏnz*), the capital of Newfoundland, in St. John's District, on the southeastern shore of the island, 60 m. N. of Cape Race. It is the terminus of the Newfoundland Government Ry. and the coastal steamship services on an inlet from the Atlantic, which furnishes a landlocked harbor. The Narrows, a channel between Pancake Rock and Chain Rock, furnishes a deep entrance into the harbor. Lighthouses of modern construction are located on Cape Spear and Ft. Amherst, which comprise two elevations 5 m. distant. The manufactures include clothes, ship bread, boots and shoes, nails, leather, soap, cordage, seines, furniture, and machinery. The export trade in fish and seal oil is extensive. The noteworthy buildings include the governor's residence, the House of the Assembly, the market, the custom house, the public hospital, and the Roman Catholic cathedral. It is the seat of Anglican, Presbyterian, United Church, and Roman Catholic colleges. It was a fishing village as early as 1580. Disastrous fires destroyed much of the city in 1846 and 1892, but it has been rebuilt and greatly improved. Population, *ca.* 45,000.

Saint Johns, a river of Florida, which rises in Brevard County and, after a course of 276 m. toward the north, flows into the Atlantic Ocean 15 m. N.E. of Jacksonville. It courses through a level region containing many orchards and groves, and is fed by springs and the overflow of swamps. For a distance of 200 m. of its lower course it is about 1 m. in width, and it is navigable for the largest steamers to Enterprise. It abounds in fish, and near it are extensive forests.

Saint John's, a city of Puerto Rico. See *San Juan*.

Saint Johnsbury (*sânt jŏnz'bĕr-ĭ*), county seat of Caledonia County, Vermont, 35 m. N.E. of Montpelier. It is on the Passumpsic River and the Maine Central and other railroads. It is the seat of Fairbanks Museum and the St. Johnsbury Acad. Among the chief buildings are the county courthouse and the St. Johnsbury Atheneum (an art museum). The manufactures include scales, maple sugar, candy, steam hammers, clothing, hardware, and farm machinery. The place was settled in 1786 and incorporated in 1884. Population, 1940, 7,437; in 1950, 7,370.

Saint John's College (*sânt jŏnz ḳŏl'ĕj*), a small, nondenominational, liberal-arts college for men, in Annapolis, Md. The college was founded as King William's School in 1696, thus being the third oldest college in the U.S., and the first public free school in America. The college has 11 buildings on 32 acres of land in the 17th century seaport town of Annapolis. Until 1937, when Stringfellow Barr became president, St. John's followed a fairly typical pattern of American higher education. But in that year the elective system was abandoned for a unique four-year all-required curriculum, based on the study of great books of Western civilization. These books are discussed in seminars which constitute the core of the formal program. The other essential parts of the curriculum are mathematics tutorials, beginning with Euclid in the freshman year and proceeding through calculus in the senior year; language tutorials devoted to the study of Greek, Latin, French, and German; a four-year laboratory program in the natural sciences; and formal lectures once weekly on liberal-arts subjects. Soon after the inauguration of this curriculum, intercollegiate athletic participation was abolished and in its place was instituted a diversified intramural sports program designed to interest the entire student body. The college has about 240 students and more than 30 faculty members. It has no graduate schools. Under the administration of Barr, who resigned in 1946, the "St. John's Plan" of education became nationally famous.

Saint-John's-Wort (*sânt-jŏnz′wûrt*), any species of a widely distributed genus (*Hypericum*) of herbs and shrubs having bright-yellow flowers. Several species are cultivated, but most are common weeds.

Saint John the Divine, CATHEDRAL OF, a Protestant Episcopalian church in New York City, on Amsterdam Ave. between 110th and 113th streets. Although the original design by Christopher La Farge and George L. Heins was Romanesque in style, the structure was altered along Gothic lines in 1911, when Ralph Adams Cram became consulting architect; the firm of Cram and Ferguson completed about two-thirds of the construction. First opened in 1899, the cathedral will be the largest Gothic-style church in the world when finished, with a seating capacity of over 7,000.

Saint Joseph (*sânt jō̆′zĕf*), a city in southwestern Michigan, county seat of Berrien County, on Lake Michigan. Located at the mouth of the St. Joseph River, the city is served by the Père Marquette, Big Four, and Michigan Central R.R.'s, and is the twin city of Benton Harbor (*q.v.*). A market for the surrounding fruit-growing region, St. Joseph manufactures paper and machinery. The city's beaches and mineral springs make it a popular summer resort. The first settlement in the vicinity was made in 1829; St. Joseph was incorporated as a city in 1892. Population, 1950, 10,223.

Saint Joseph, county seat of Buchanan County, Mo., on the Missouri River (with a river frontage of *ca.* 3 m.), 65 m. N.W. of Kansas City. It is served by the Chicago Great Western, the Atchison, Topeka & Santa Fe, the Missouri Pacific, and other railroads.

Saint Joseph is noted as a railway, shipping, and slaughtering center, and has a large number of flour mills, meat-packing plants, breweries, and grain elevators. It is the seat of a state hospital for the insane and of the state fish hatchery.

Indian traders and trappers made settlements in the vicinity of St. Joseph in 1826. The city was founded in 1843 and made the county seat in 1846. After the discovery of gold in California, it became an important emigrant station. Population, 1900, 102,979; in 1950, 78,588.

Saint-Just (*săn̲-zhüst′*), ANTOINE LOUIS DE, revolutionary leader, born in Décize, France, Aug. 25, 1767; died in Paris, July 28, 1794. He studied at Soissons and later took a law course at Rheims, where he became imbued with ideas of the approaching French Revolution (*q.v.*). In 1792 he was elected a delegate to the National Convention in Paris. A strong friendship sprang up between him and Robespierre (*q.v.*), and the two men were closely associated during the Reign of Terror. In 1793 Saint-Just was appointed commissioner to the Army of the Rhine and helped to defeat the allied armies and expel them from French soil. On his return to Paris he was made president of the National Convention, where his reports were instrumental in sending Louis XVI to the guillotine and the followers of Danton and Hébert (*qq.v.*) before the revolutionary tribunal. However, the political atmosphere changed its orientation, and Robespierre and Saint-Just were arrested on the Ninth of Thermidor (July 27, 1794); they were executed the next day.

Saint Kitts (*sânt ķĭts′*) or SAINT CHRISTOPHER, an island in the British West Indies, one of the Leeward Islands, separated from Nevis by a strait 2 m. wide. Saint Kitts, with an area of 68 sq. m., is the chief island in the St. Kitts-Nevis presidency. Basseterre (pop., *ca.* 12,000) is the capital and largest town. Of volcanic origin, the island is mountainous and fertile, and is noted for its spectacular scenery. Among its products are sugar, molasses, coconuts, and cotton. Saint Kitts was supposedly discovered by Columbus, in 1493, and was the first Caribbean island to be settled by the British (1625). Population, *ca.* 30,000.

Saint Laurent (*săn̲ lô-răn̲′*), LOUIS STEPHEN, statesman, born in Compton, Quebec, Canada, Feb. 1, 1882. He attended St. Charles Coll., Sherbrooke, and Laval Univ., Quebec, and was called to the bar in Quebec in 1905. He was president of the Canadian Bar Assn. (1930-32). In 1941 he entered politics, serving as minister of justice and attorney general until 1946, and again in 1948. He was a member of the Canadian delegation to the San Francisco Conference, in 1945, at which the U.N. was organized. In 1948 Saint Laurent was chosen to succeed the retiring W. L. Mackenzie King as head of the Liberal party and as prime minister of the dominion. Canada prospered under his administration, and he was confirmed in his position in a general election held in 1953.

Saint Lawrence (*sânt lạ′rẹns*), one of the most important rivers of North America, the outlet of the Great Lakes into the Atlantic Ocean. The St. Lawrence is one of the final links in a continuous waterway extending about 2,350 m. from the western shore of Lake Superior to the Atlantic. The St. Lawrence proper starts from the northeastern end of Lake Ontario and flows about 740 m. to its mouth in the Gulf of St. Lawrence. As the river emerges from Lake Ontario, it forms a broad channel filled with islands, which are known as the Thousand Islands. For a distance of about 114 m., the river forms the international boundary between New York State and the Canadian province of Ontario.

Canals are utilized to pass the rapids between Montreal and Lake Ontario, which consist principally of the Lachine, the Cascade, the Coteau, the Cedar, and the Long Sault Rapids. Niagara Falls is passed by the Welland Canal, and Lake Superior is reached through the Sault Ste. Marie Canals, which pass around St. Marys Falls. The principal tributaries of the St. Lawrence proper are the Richelieu, Saguenay, Ottawa, St. Maurice, Chaudière, and St. Francis rivers. At its entrance into the Gulf of St. Lawrence, the river forms a broad inlet about 100 m. wide, but the general width to Lake Ontario is from 1 to 4 m. Navigation is entirely obstructed by ice during the winter months.

Saint Lawrence, GULF OF, an inlet from the Atlantic Ocean, on the northeastern shore of North America. It is partly enclosed by Newfoundland, Nova Scotia, New Brunswick, and Quebec. The Gulf of St. Lawrence forms a large continuation of the estuary of the St. Lawrence River and communicates with the open sea by Cabot Strait, between Nova Scotia and Newfoundland, which has a width of 65 m. It is also connected with the Atlantic by the Strait of Belle Isle, lying between Labrador and Newfoundland, and by the Strait of Canso, between Nova Scotia and Cape Breton. It has excellent fisheries. The principal islands in the gulf are Prince Edward, Anticosti, St. Paul's, and the Magdalen Islands.

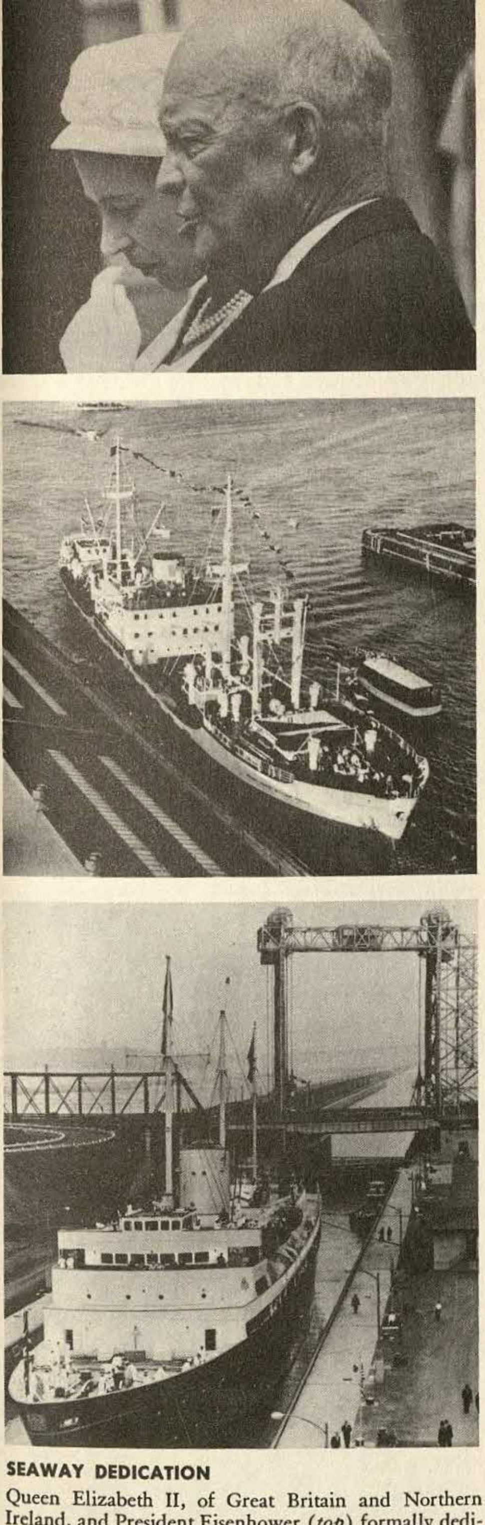
Saint Lawrence Island, an island in the Bering Sea, about 120 m. off the west coast of Alaska. The island is 95 m. long and from 10 to 35 m. wide. A few Eskimo families conduct whaling and trapping operations here, and several archaeological expeditions from the Univ. of Alaska have studied the remains of early Eskimo civilization on the island.

Saint Lawrence Seaway and Power Project (*sē'wā*), a U.S.-Canadian waterway and hydroelectric power project. It was opened and put into use for deep-draft navigation on April 25, 1959, and officially dedicated by President Eisenhower and Queen Elizabeth II, on June 26, 1959. The completion of the seaway permits most ocean-going vessels to travel from the Atlantic Ocean to the head of the Great Lakes (602 ft. above sea level); it also permits the Great Lakes fleet to proceed to the St. Lawrence Gulf.

The construction included the modernization of existing navigation facilities from Lake Erie to Montreal, Que. The length of the seaway is 182 m. from Montreal to Lake Ontario and another 186 m. from there through the Welland Canal to Lake Erie. The channel was deepened,

MIDWESTERN SEAPORT

This squadron of U.S. Navy ships, the first to sail the Great Lakes in 142 years, visited Chicago, Ill., in 1959 to take part in the dedication of the St. Lawrence Seaway



SEAWAY DEDICATION

Queen Elizabeth II, of Great Britain and Northern Ireland, and President Eisenhower (*top*) formally dedicated the St. Lawrence Seaway on June 26, 1959. The *Prins Johan Willem Friso* (*center*), the first ocean-going ship to traverse the Seaway, docks at Milwaukee, Wis. The British royal yacht *Britannia* (*bottom*) passes through the St. Catherine lock (*Wide World Photos*)

and the number of locks was reduced from 25 to 14, all uniformly 768 ft. long and 80 ft. wide, with a sill depth of 30 ft. Construction of the project, administered for the U.S. by the St. Lawrence Seaway Development Corp. and for Canada by the St. Lawrence Seaway Authority, was begun in January 1955. The ultimate cost was estimated at *ca.* $475,000,000, of which two-thirds was assumed by Canada. The connecting channels of the Great Lakes above Lake Erie were being deepened to 27 ft. by the U.S. and were expected to be completed by 1964, at an additional cost of $140,000,000. Tolls are imposed on ships using the waterway. During the first month of operation, 2,500,000 tons of cargo were carried through the St. Lawrence-Great Lakes waterway. This volume, in turn, created difficulties in berthing ships at lake ports, and many ports began to improve their facilities. Large waterway ports include Quebec, Montreal, Hamilton, and Toronto, in Canada; Rochester and Buffalo, N.Y.; Erie, Pa.; Cleveland and Toledo, Ohio; Detroit, Muskegon, and Bay City, Mich.; Green Bay and Milwaukee, Wis.; Duluth, Minn.; Chicago, Ill.; and Gary, Ind.

An integral part of the seaway project is the plant to develop hydroelectric power in the International Rapids section. The heart of the installation is the Moses-Saunders Power Dam, 3,300 ft. long, spanning the St. Lawrence River between Barnhart Island, N.Y., and the Canadian mainland. Constructed jointly by the Power Authority of the State of New York and the Hydro-Electric Power Commission of Ontario, its cost of $650,000,000 was borne equally by both parties and its output was to be shared equally by them. In size second only to Grand Coulee Dam in the U.S., the Moses-Saunders Dam can turn the power of the St. Lawrence River, flowing from the Great Lakes to the Atlantic Ocean at the rate of 250,000 cu. ft. per second, into 2,100,000 h.p. of electricity, or more than 1,000,000,000 kw.

The history of the seaway began in 1895 when Canada and the U.S. set up a joint study commission. Canada built (1912-32) the Welland Canal between Lake Ontario and Lake Erie to bypass Niagara Falls. In 1932, and again in 1941, the U.S. Congress rejected seaway bills, but after Canada decided (1951) to build the seaway alone, the Wiley-Dondero Act authorizing U.S. participation was approved by Congress. It was signed by President Eisenhower on May 13, 1954, 37 years after the first seaway bill was introduced in Congress.

Saint Leger (*sânt lĕj′ẽr*), BARRY, soldier, born in England in 1737; died in 1789. He was of Huguenot ancestry, studied at Cambridge, and entered the army as an ensign in 1757. He was sent to America in 1758 and took part in the

Courtesy Bettmann Archive, N.Y.

BARRY SAINT LEGER

French and Indian War and at the siege of Louisburg. Later he fought under Gen. Wolfe at Quebec. In 1777 he was put in command of a force that was intended to proceed through the Mohawk Valley and join Gen. Burgoyne at Albany. Saint Leger's troops suffered severe losses at the battle of Oriskany and retreated to Canada. He was promoted to the rank of colonel in 1780 and conducted a guerrilla warfare, with headquarters at Montreal, until the close of the Revolutionary War.

Saint Louis (*sānt lo͞o′ĭs*), a city and port of entry in east central Missouri, independent of St. Louis County, the largest city in the state and tenth-largest in the U.S., located on the Mississippi River approximately halfway between its source and mouth and 12 m. s. of the confluence of that river and the Missouri River. The city is 61 sq. m. in area.

The central business district of the city extends westward from the river to 12th Blvd., between Market St. on the south and Washington Ave. on the north. Mixed industrial-residential areas surround the downtown core. Then residential districts, usually with tree-lined streets, fan out to the north, west, and south. Principal north-south routes crossing the city are 12th Blvd.; Grand Blvd., 2 m. farther west, which is lined with major theaters and some office buildings; and Kingshighway Blvd., 1½ m. farther west, serving uptown hotels and bordering Forest Park. From Union Station (built in 1874) at 18th St. eastward to 12th Blvd., there is a continuous plaza lined by City Hall, municipal courts, Convention Hall, the Federal Building, and the Public Library. The Statler, Jefferson, Mayfair, and the Lennox are principal downtown hotels; on the West Side near Forest Park are the Chase and Park Plaza.

Historic sites include the Old Court House, completed in 1864 and current headquarters of the Museum of National Expansion; the Lisa Warehouse, oldest building remaining from the early town; the Old Cathedral, completed in 1834 on a site occupied by a church since 1770; and the Campbell House at 15th St. and Locust St. Outstanding among structures of the 19th and 20th centuries are the Wainwright Building (1891), an early example of steel-girder construction designed by Louis Sullivan, mentor of Frank Lloyd Wright; the 31-story Bell Telephone Co. structure, the highest in the city; and the Railway Exchange building (1914), which houses a department store and offices. Important religious structures include Christ Church Cathedral (Protestant Episcopal) and the Cathedral of St. Louis (Roman Catholic). Records Centers of the Defense Dept. and Air Force are located within the city.

There are about 70 parks covering 3,000 acres Forest Park, on the western edge of the city, contains the St. Louis Municipal Theatre, which presents light opera in summer, a zoo, the City Art Museum, and the Jefferson Memorial, which houses the Charles A. Lindbergh trophies. The Carl Milles fountain (1940) in the Aloe Plaza, facing the Union Station, has 14 bronze figures symbolizing the meeting of the Mississippi and Missouri rivers.

St. Louis has a National League baseball team, the Cardinals, and a professional basketball team, the Hawks.

Transportation: As the nation's second most important railroad center, St. Louis is served by 18 railroad lines, among them the Missouri Pacific, St. Louis-San Francisco (Frisco), Pennsylvania, New York Central, and Baltimore & Ohio. Union Station is the largest unified railroad terminal in the country, with the world's largest mechanized mail-handling facility. Lam-

MILLES' "MEETING OF THE WATERS"

Courtesy St. Louis Post-Dispatch

bert-St. Louis Municipal Airport, completed in 1956 and about 12 m. from downtown, is an architecturally outstanding terminal. The river is spanned by seven bridges.

COMMERCE AND INDUSTRY: St. Louis is surrounded by a large, immediate market with access to necessary agricultural products and raw materials. It is a grain center and a cattle and farm market. Lead, zinc, iron, and coal are found in the vicinity. As a financial center, it is the seat of Federal Reserve Bank, District 8.

Products of St. Louis' industries include shoes, beer, meat and food products, chemicals, automobiles, aircraft, book matches, dry goods, barber supplies, electric fans, hardware, iron and steel, and railroad and street cars. Fur processing, sugar refining, and petroleum production are other industries. St. Louis is the center of a standard metropolitan statistical area (3,187 sq. m.; pop., 1960, 3,633,008) which includes three counties in Missouri and two counties in Illinois. The area's value added by manufacture, 1958, was $2,383,826,000; the city had a value added of $1,340,291,000.

LAMBERT-ST. LOUIS MUNICIPAL AIRPORT

Courtesy St. Louis Post-Dispatch

EDUCATION: The public-school system enrolls *ca.* 103,000 pupils annually; another 36,000 pupils are educated in parochial schools. Among special schools, the Central Inst. for the Deaf is nationally known. The oldest institution of higher learning is St. Louis Univ., founded in 1829. Other institutions include Washington Univ., Covenant Coll., Concordia Sem., Harris Teachers Coll., and two medical schools associated with St. Louis and Washington universities.

The Missouri Botanical Garden, called Shaw's Garden after its donor, Henry Shaw (1800-89), a merchant, who settled in St. Louis in 1819, contains the largest collection of plant life in the Western Hemisphere, as well as a botanical library and laboratories. The St. Louis Art Museum is in Forest Park. The historical museum of the Missouri Historical Society is in the Jefferson Memorial, also in Forest Park; it houses the major collection of the papers of Thomas Jefferson and many documents pertaining to the settlement of the West.

The St. Louis Symphony Orchestra is a major U.S. ensemble. In addition to the public library, containing more than 1,000,000 volumes, there is the Mercantile Library (founded in 1846), with a valuable collection of Americana.

GOVERNMENT: By the charters of 1876 and 1914, St. Louis operates under a dual (municipal and county) form of government, the territorial jurisdictions of which are identical. The city is not located within the boundaries of any county, which makes it unusual among U.S. cities. The chief officer is a mayor, who serves for four years, and there is a 28-member board of aldermen, plus a president, all elected for four-year terms. The county form of government is retained with such offices as sheriff, recorder of deeds, and public administrator. The police department and board of election commissioners are under state control.

HISTORY: The colonial village of St. Louis was established by French traders in 1764. Pierre Laclède, fur trader and pioneer, named the settlement for St. Louis (Louis IX of France), his patron saint. Laclède laid out a public square on the river front bounded by what is today Walnut, First, and Market Sts. In 1770 Spanish officials arrived to take over the region, and for 30 years St. Louis had a unique French culture and a Spanish government. In 1803 the Louisiana Purchase changed it into an American settlement.

As headquarters for the Rocky Mt. fur trade, St. Louis became a thriving town. It was supply base and market place for the frontier. Along the river front large steamboats from the East and South mingled with smaller boats from outposts of the upper Mississippi and Missouri. The first legislature under the state's constitution of 1821 met in the city.

In 1822 the city of St. Louis was incorporated, and the western boundary was set at Seventh St.; in 1876 the boundary was fixed at 600 ft. w. of Skinker Road, which was then well beyond the populous urban area.

The city experienced a series of disasters in its early years, including the flood of 1844 and a cholera epidemic and fire in 1849. In 1904 a world's fair celebrated the Louisiana Purchase, and since then the city has continued to grow in economic importance and population.

Because the city cannot expand geographically, improvement has meant rebuilding. St. Louis' post-World War II program therefore stresses urban redevelopment, such as the construction of expressways, hospital and health centers, slum clearance, street improvements, and flood control.

The population of St. Louis showed its greatest increase in the decade from 1860 to 1870, when it rose from 160,773 to 310,864. In 1900 the population was 575,238; in 1930, 821,960; in 1950, 856,796; and in 1960, 750,026.

Saint-Louis (*săn̲-lwē′*), a city in the Republic of Senegal, a former French territory which became independent in August 1960. It is located on an island in the Senegal River, *ca.* 150 m. N.E. of the capital, Dakar, with which it is connected by railroad. Saint-Louis was once a large commercial center but has been surpassed by Dakar. It exports peanuts, hides, and skins. Founded in 1659, it is the oldest former French colonial site in Africa. Population, 1957, 39,800.

Saint Louis (*sânt lo͞o′ĭs*), UNIVERSITY OF. See *Universities and Colleges.*

Saint Lucia (*sânt lū′shạ*), an island, in the West Indies, forming one of the four colonies included in the Windward Islands. Saint Lucia, which has an area of 233 sq. m., is of volcanic origin and has a mountainous surface. Among its chief products are sugar, copra, coconuts, cocoa, vegetables, lime oil and juice, honey, and bananas and other fruits. Thought to have been discovered by Columbus in 1502, St. Lucia was taken by the French in 1660 but was long fought over before going permanently to Great Britain in 1814. The people are chiefly Negroes, who speak a French patois which is gradually being replaced by English. The capital is Castries. In 1940 the U.S. received a 99-year lease on the island to establish a military base. Population, 1960, *ca.* 94,700.

Saint-Malo (*săn̲-mȧ-lō′*), a seaport in northwestern France, in the department of Ille-et-Vilaine, 51 m. N.W. of Rennes. It is situated on an island at the mouth of the Rance River, on the English Channel. An old, picturesque city, it was named after a Cambrian priest, who sought refuge here in the 6th century. Surrounded by ramparts of the 14th, 15th, and 16th centuries, St.-Malo has a 14th-century castle and a cathedral which was begun in the 12th century but not completed until 1859. It is a naval station, and its industries include iron goods, rope, and sailcloth. It also carries on an extensive trade in agricultural products, timber, and coal. Population, 1954, 14,339; 1962, 25,948.

Saint Mark's Cathedral (*sânt märks kă-thē′drạl*). See *Venice.*

Saint Marys River (*sânt mâr′ēz rĭv′ẽr*), the name of three rivers in the U.S. The first, which forms part of the U.S.-Canada border, flows in a generally southeasterly direction from Whitefish Bay, an inlet of Lake Superior, to the northern corner of Lake Huron. Its length is *ca.* 60 m. and includes the St. Marys Falls and the Sault Sainte Marie Canals (*q.v.*) which make the river navigable for its full course. The second river originates in western Ohio in Auglaize County and flows *ca.* 110 m. into Indiana, terminating at Ft. Wayne, where it joins the Maumee River. The third river originates in the Okefenokee Swamp in southeastern Georgia and northeastern Florida and flows *ca.* 175 m. before emptying into Cumberland Sound on the Atlantic Ocean. It forms part of the Florida-Georgia boundary.

Saint Maurice (*sânt mô-rēs′*), a river in the province of Quebec, Canada. It rises in a chain of lakes and flows generally southeastward, for a distance of 325 m., to Three Rivers, Que., between the cities of Quebec and Montreal, where it empties into the St. Lawrence River. At Shawinigan Falls, a city 18 m. N.W. of Three Rivers, the river forms a falls with a drop of 165 ft., which furnishes electric power for local industries and for Montreal.

Saint-Mihiel (*săn̲-mē-yĕl′*), a town in France, in the Meuse department, situated on the Meuse River, 33 m. N.W. of Nancy. Located here is an abbey founded in 709 and rebuilt in the 17th century. As a key railway center, St.-Mihiel was captured by the Germans early in World War I, and during Sept. 13-16, 1918, it was the site of the first American offensive of the war. About 550,000 U.S. troops, under the command of Gen. John Pershing, were involved in the successful engagement, which resulted in the capture of 16,000 Germans and much equipment. American casualties totaled *ca.* 7,000. Population, 1962, 5,336.

Saint-Nazaire (*săn̲-nă-zâr′*), a seaport in France, in the Loire-Atlantique Department, located at the mouth of the Loire River, 33 m. N.W. of Nantes. It is a key commercial port, with extensive shipbuilding facilities; and there are iron and steel plants. During World War I, it was a debarkation point for U.S. troops. In World War II, the city was virtually destroyed by Allied air attacks because of its use as a German submarine base, but the port and shipyards were rebuilt after the war. Saint-Nazaire is believed to have been the site of an ancient Roman maritime town called Carbilo, and it served as a shipyard as early as 56 B.C. Population, 1954, 39,350; 1962, 59,181.

Saint Nicholas (*sânt nĭk′ọ-lạs*). See *Nicholas, Saint.*

Saint Patrick's Cathedral (*sânt păt′rĭks kạ-thē′drạl*), Roman Catholic cathedral in New York City, on Fifth Ave., between 50th and 51st Sts. Designed in the shape of a cross by the American architect James Renwick (1818-95), the Gothic-style church was begun in 1858, dedicated in 1879, and consecrated on Oct. 5, 1911. Its twin spires (330 ft. high) were completed in 1888. The $4,000,000 structure is 398 ft. in length and 174 ft. in width, and the entire exterior above the base line is of white marble. Behind the main altar is the Lady Chapel, which was completed in 1906, and there are 16 side altars.

Saint Paul (*sânt pôl*), capital and second-

Courtesy Northwest Orient Airlines

APPROACH TO THE CAPITOL, SAINT PAUL, MINNESOTA

largest city of Minnesota, seat of Ramsey County, situated on the Mississippi River, immediately east of Minneapolis (*q.v.*).

DESCRIPTION: The city has an area of 55.5 sq. m., the greater part of which is located on the left (northern) bank of the river. The right bank is lined with high bluffs; the left presents a series of natural benches (or levels) within a horseshoe bend of the stream. On the first level are the railroad yards; on the second is the business section, and on the third and highest, the residential area.

Like its twin city, Minneapolis, St. Paul owes its importance to the fact that it is located at the head of navigation of the Mississippi River. A 9-ft. channel in the river provides an all-water route in the heart of the city, which is served by the Northern Pacific, the Great Northern, the Chicago, Burlington and Quincy, the Chicago, Milwaukee, St. Paul and Pacific, and other railroads. The Holman Municipal Airport is 2 m. from the center of the city.

The city's parks cover an area of 2,359 acres and include Indian Mounds Park (so named because it was once the burial ground of the Sioux Indians); Phalen Park; Highland Park; and Como Park, known for its zoological and botanical gardens. On the northern edge of the city are the state fairgrounds, the scene of the annual state fair. It is the largest event of its kind in the U.S., attracting about 1,000,000 visitors annually. Other traditional events are the St. Paul Winter Carnival (lasting nine days) and the Triennial Festival of Nations. Among St. Paul's outstanding buildings is the state capitol, standing on a rise in the heart of the city. This structure (completed in 1905) was designed by Cass Gilbert (*q.v.*) and is visible as the city is approached from almost any direction. Other landmarks include the Minnesota Historical Society, the St. Paul Inst. (St. Paul Science Museum) and Ft. Snelling, a disestablished U.S. Army post which adjoins the city on the southwest, on the site of a historic fort (built in 1819).

COMMERCE: Saint Paul is one of the leading commercial, industrial, railroad, and livestock centers of the West North Central region. Its major industries are meat packing, processing of dairy products, printing, advertising specialties, machine shops, foundries, furs, and the production of automobiles and accessories, abrasives, refrigerators, breweries, and paper products. The metropolitan area of St. Paul (which includes all of Ramsey County) covers 171 sq. m. and has an estimated population of 420,000 (1958). In 1954 the value added by manufacture in St. Paul itself was $425,576,000.

EDUCATION: The public-school system enrolls about 43,000 pupils annually; the parochial schools, 32,500 pupils. Institutions of higher learning include Hamline Univ., Macalester Coll., Coll. of St. Catherine, Coll. of St. Thomas, Bethel and Concordia junior colleges, St. Paul Sem., and the agricultural school of the Univ. of Minnesota.

GOVERNMENT: Saint Paul was incorporated as a city in 1854 and adopted the commission form of government in 1914. Its mayor, comptroller, and six councilmen are elected for two-year terms.

HISTORY: Saint Paul, originally known as St. Paul's Landing, was first settled in 1837, and by 1840 it had a population of 200, mostly French. Father Lucien Galtier helped them to build a log church on the top of a bluff and dedicated it to St. Paul. The town soon became a port of call for many steamboats, and when the Minnesota Territory was created, in 1849, St. Paul became the capital city. Hundreds of immigrants heading for the surrounding farmlands moved through the city, and as the nearby small towns grew up the city became a trading center. Railroads leading to Lake Superior and southern Minnesota helped to make St. Paul the railroad center of the state, and James J. Hill (*q.v.*), well-known railroad promoter, made his headquarters in the city.

POPULATION: The decade of the 1850's showed the greatest proportionate growth of the St. Paul population—from 1,112 in 1850 to 10,401 in 1860.

The greatest numerical growth occurred in 1880-90 (41,473 to 133,156). The population in 1910 was 214,744; in 1950, 311,349; and in 1960 it was 313,411.

Saint Paul de Loanda (*sânt pól dē lō-än'-dạ*). See *Loanda.*

Saint Paul's Cathedral. See *London.*

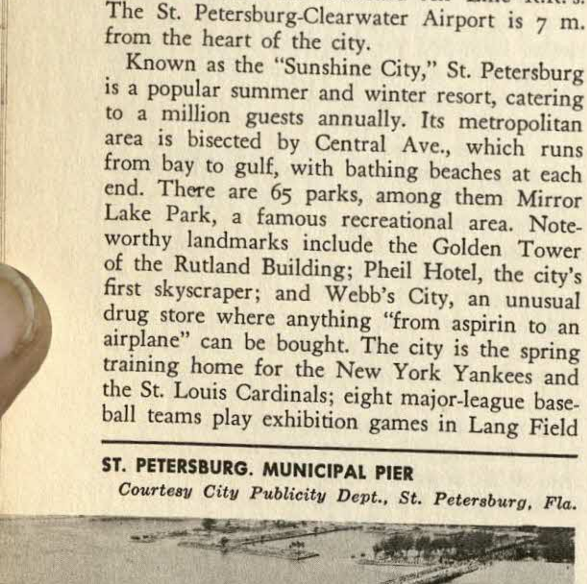
Saint Peter (*sânt pēt'ēr*), a city in Minnesota, seat of Nicollet County, on the Minnesota River, 67 m. s.w. of Minneapolis. It is on the Chicago and North Western Ry. and is surrounded by a farming region. It is a farm market, and its products include dairy products, washed gravel, and clothing. Gustavus Adolphus Coll. is located here. Saint Peter, founded in 1854, was incorporated as a village in 1865 and as a city in 1891. Population, 1950, 7,754.

Saint Petersburg (*sânt pē'tērz-bûrg*), a city in Pinellas County, Florida, surrounded on three sides by Boca Ciega and Tampa bays and the Gulf of Mexico and connected with the Florida mainland at Palmetto-Bradenton by the 15-m. Sunshine Skyway toll bridge. The city covers an area of 58 sq. m. and is served by the Atlantic Coast Line and the Seaboard Air Line R.R.'s. The St. Petersburg-Clearwater Airport is 7 m. from the heart of the city.

Known as the "Sunshine City," St. Petersburg is a popular summer and winter resort, catering to a million guests annually. Its metropolitan area is bisected by Central Ave., which runs from bay to gulf, with bathing beaches at each end. There are 65 parks, among them Mirror Lake Park, a famous recreational area. Noteworthy landmarks include the Golden Tower of the Rutland Building; Pheil Hotel, the city's first skyscraper; and Webb's City, an unusual drug store where anything "from aspirin to an airplane" can be bought. The city is the spring training home for the New York Yankees and the St. Louis Cardinals; eight major-league baseball teams play exhibition games in Lang Field (seating capacity, 8,000). The Florida headquarters of the U.S. Coast Guard Air-Sea Rescue Service and a U.S. Naval Reserve Station are located at Bayboro Harbor. MacDill Air Force Base is located 6 m. E. of the city, on Gadsden Pt., across Tampa Bay.

ST. PETERSBURG. MUNICIPAL PIER

Courtesy City Publicity Dept., St. Petersburg, Fla.



The leading industry, next to tourism, is construction. Manufactures include tropical furniture, Venetian blinds, toys, women's wear, precision instruments, electronics equipment, and concrete-block-making machinery.

The enrollment in the city's public and parochial schools numbers *ca.* 33,000 annually. Among the educational institutions are St. Petersburg Junior Coll., Gibbs Junior Coll., Stetson Univ. Law Coll., Southeastern States Law Library, and Adm. Farragut Naval Acad. Cultural facilities include a museum on the Municipal Pier (the Pier is also famous for extensive recreational features), a civic arts and crafts school, a Little Theater, two symphony orchestras, a planetarium, and a senior citizens' center.

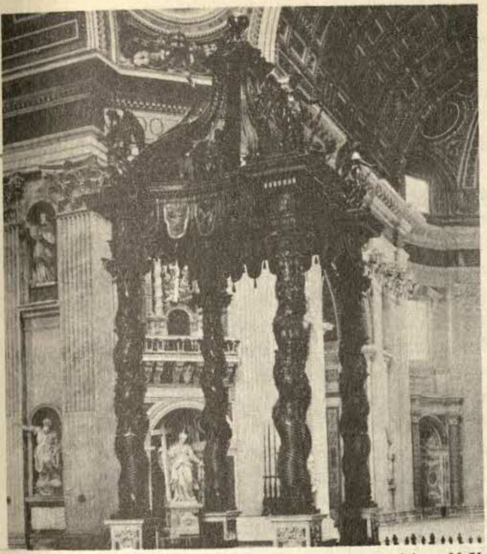
The city charter was adopted in 1931, and the government consists of six councilmen elected for four-year terms, a mayor, elected at large for a two-year term, and a city manager, chosen by the council.

The history of St. Petersburg dates back to 1528 when the explorer Panfilo de Narváez (*q.v.*) landed on the coast of Florida. Founded in 1888, it was incorporated as a town in 1892 and as a city in 1903. Its population rose from 1,575 in 1900 to 60,812 in 1940. Its decade of greatest growth was from 1950, when the population was 96,738, to 1960, when it was 181,298.

Saint Petersburg, a city in Russia. See *Leningrad.*

Saint Peter's Church, the most celebrated and largest church in Christendom, situated in the see of Rome, Italy, adjoining the buildings of the Vatican. It is the church where the popes celebrate Mass on certain occasions and where newly created cardinals kneel in prayer (see also *Cardinal*).

The present structure, which occupies the site of a five-aisled basilica (*q.v.*) built by Constantine the Great above the grave of St. Peter, was originated in the early 16th century. At that time, Pope Julius II assigned the task of planning an entirely new church to Bramante, the famous Italian architect who was among the originators of the Renaissance style in architecture. Bramante's design envisioned a church in the form of a Greek cross—with four equal arms—surmounted by a central dome. After his death (1514), other equally famous architects continued the work—among them Raphael, Peruzzi, and Antonio de Sangallo—but his original plans underwent many changes. Eventually, in 1547, Michelangelo took charge, and when he



Courtesy The Bettmann Archive, N.Y.

HIGH ALTAR OF ST. PETER'S CHURCH

died, in 1564, a ground plan had been agreed upon and the cupola was half finished. In 1606 the plans were revised again when Pope Paul V ordered the layout changed into the form of a Latin cross, *i.e.,* a central-domed church with a long nave. This task was assigned to Carlo Maderna, who also added the elaborate portico and façade, completed in 1640, topped by a balustrade with a row of statues: Christ, St. John the Baptist, and the Apostles, except for St. Peter. Colonnades designed by Lorenzo Bernini were added in 1655-67; they embrace St. Peter's Square in front of the west façade like a giant's arms (for illustrations, see *Architecture; Vatican City*).

Pope Urban VIII consecrated the present building on Nov. 18, 1626. The over-all length of the church, including the portico, is 700 ft.; its internal length is 600 ft., and the width across the transept is 450 ft. The dome, with an interior height of 404 ft., rests on four huge piers, each 234 ft. in circumference. The high altar is located under the dome. A 95-ft. bronze canopy, also designed by Bernini, rises above the altar, carried by four gilded columns. Nearby is a 5th-century bronze statue of St. Peter seated on a chair. Both sides of the church are lined with ornately decorated chapels. The whole church is full of highly prized art treasures; among them, Michelangelo's *"Pietà"* is the most important artistically. Of the three bronze doors in the portico, the right door is the *Porta Santa,* or Holy Door, which—usually walled up—is opened during a Holy Year (*q.v.*).

Saint-Pierre (*san̲′ pyâr′*), JACQUES HENRI BERNARDIN DE, author, born in Le Havre, France, Jan. 19, 1737; died in Éragny-sur-Oise, Jan. 21, 1814. He studied at Caen and Rouen and went as an engineer to Malta. He was later thus employed in Russia and Germany and in 1768 went to Mauritius, serving the French government as engineer in that island for about three years. He returned to France in 1771 to publish accounts of his voyages and other literary works. His work entitled "Paul and Virginia" is a romantic story founded on an incident witnessed in Mauritius. It has been translated into many languages, including the Russian, German, English, Dutch, and Romance languages. He also wrote "Voyage to the Isle of France." Napoleon extended many honors to St.-Pierre, enabling him to pass the closing years of his life at Éragny in comfortable circumstances.

Saint Pierre and Miquelon (*săn̲ pyâr, mē-k̦lôn̲′*), an overseas territory of France, consisting of two main islands and several small dependencies, located *ca.* 15 m. s. of Newfoundland. The area is 93 sq. m. Of the two main islands, St. Pierre is the smaller; Miquelon, the larger, actually consists of two parts, Great Miquelon and Little Miquelon (or Langlade), joined by a slender isthmus. The islands are of volcanic origin and have a rocky coastline. Economic life is based on fishing, which brought little profit until development of a frozen fish industry was begun in 1949. There is little agriculture, and most food is imported.

The first permanent French fishing settlement occurred in the early 17th century. The islands have alternated between Great Britain and France but have been in French possession since 1816. The people are French citizens and are represented in the French assembly. Local government is administered by a French overseas administrator and a 14-member general council. The capital is St. Pierre, on the island of the same name. Population, 1951, 4,606.

Saint - Quentin (*săn̲-k̦ăn̲-tăn̲′*), a city in France, in the department of Aisne, on the Somme River, 92 m. N.E. of Paris. It has extensive railroad facilities and is on the St.-Quentin Canal, which unites the Somme and the Scheldt rivers. Among the noteworthy buildings are the Church of St.-Quentin, the public library, and the hôtel de ville. Among the manufactures are cotton and woolen goods, embroidery, billiard balls, engines, hardware, and machinery. The surrounding country contains many manufacturing towns and is a productive fruit and dairying region. The Spanish captured St.-Quentin in 1557. On Jan. 19, 1871, it surrendered to the German army. It was again captured by the Germans in 1914 and held until 1918, when it was occupied by the Allies after hard fighting. It also came under German occupation in World War II. Population, *ca.* 57,000.

Saint-Saëns (*săn̲-sän̲z′*), (CHARLES) CAMILLE, composer, born in Paris, Oct. 9, 1835; died in Algiers, Dec. 16, 1921. An early piano prodigy,

CAMILLE SAINT-SAËNS

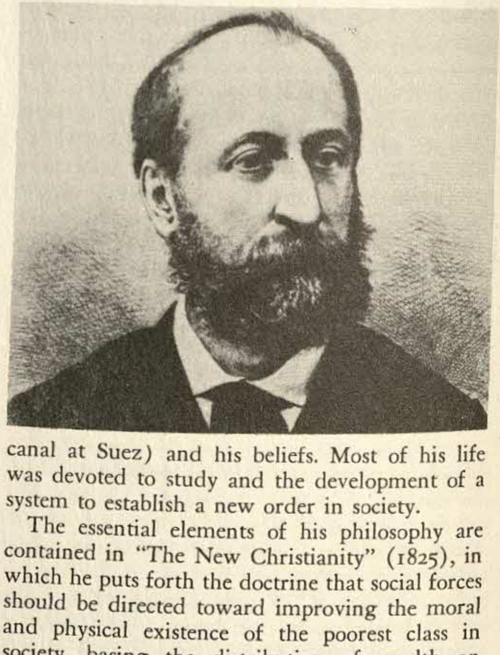
St.-Saëns composed his first piece at the age of six and gave his first public concert at the age of 10. Entering the conservatory at 12, he soon mastered the organ, becoming one of the greatest organists of his day. He was organist at the Church of St.-Merry from 1853 to 1857, then being appointed organist at the famous Church of the Madeleine, a position he held until 1877. It was while he was at the Madeleine that St.-Saëns achieved his reputation as a teacher, having among his pupils such men as the gifted Gabriel-Urban Fauré, the composer-organist, who later became director of the Paris conservatory and teacher to Debussy. While at St.-Merry, he met Liszt, who became a close friend of the young virtuoso and whose influence can be noted in St.-Saëns' first and second symphonies.

Although he wrote 12 operas during his lifetime, St.-Saëns is like Gounod and Bizet in that only one of his operas ever achieved popularity. That opera was "Samson et Dalila," a piece that was consistently rejected by the Paris Opera Co. for more than a dozen years. Finally, through the intercession of Liszt, it was produced at Weimar, Germany, in 1877; but it was not until 1890 that the Paris Opera would agree to perform the piece. After the first performance, it remained a permanent part of the company's repertoire.

During the 1870's St.-Saëns devoted himself to many long trips through Europe, sometimes performing as an organist and pianist and sometimes leading his own orchestral works. It was while on these tours that he composed some of his outstanding symphonic poems; included in this group are *"Le Rouet d'Omphale," "Danse Macabre," "Phaëton,"* and *"Le Jeunesse d'Hercule."* His most outstanding symphonic work, the "Third Symphony in C Minor," dedicated to Liszt, was presented for the first time in London in 1886. After the turn of the century, he spent a great deal of time traveling in North Africa, French Indo-China, and the Americas. To this period belong his *"Suite Algérienne"* and "Africa," as well as his numerous books, plays, poems, and philosophical treatises. Although he was a prolific composer, many authorities agree that his fame rests on his work as a musician rather than as a composer.

Saint-Simon (*sän′ sē-môn′*), CLAUDE HENRI, COMTE DE, social philosopher, born in Paris, France, Oct. 17, 1760; died there May 19, 1825. He served (1778-83) as a volunteer with French troops in the American Revolution and then returned to France, where his activity during the French Revolution resulted in a brief imprisonment. He later speculated in land and amassed a small fortune but lost it all in advancing his ventures (*e.g.,* the promotion of a canal at Suez) and his beliefs. Most of his life was devoted to study and the development of a system to establish a new order in society.

CLAUDE HENRI COMTE DE SAINT-SIMON



The essential elements of his philosophy are contained in "The New Christianity" (1825), in which he puts forth the doctrine that social forces should be directed toward improving the moral and physical existence of the poorest class in society, basing the distribution of wealth on capacity and labor. He did not, however, advocate revolt but sought to have industrial and scientific leaders direct the reorganization of society. His works did not attract widespread attention until after his death, when his followers formulated his doctrines as Saint-Simonianism. Ultimately, he had great influence on Socialist thought in his country. "The Industrial Catechism" (1824) is another of his chief works. See also *Communism; Socialism.*

Saint-Simon, LOUIS DE ROUVROY, DUC DE, soldier and author, born in Versailles, France, Jan. 16, 1675; died in Paris, March 2, 1755. He belonged to a different branch of the family than the above and was the godson of Louis XIV. After studying for a short time under the Jesuits, he entered military service in 1692, but after serving in several campaigns he gave up his commission in 1702. Although disliked by Louis XIV, he attached himself to the court through the dukes of Burgundy and Orléans and from this vantage point became well informed of the practices and proceedings of court life. He was, however, ousted from court in 1723 and spent the later years of his life in writing his "Memoirs," which proved an invaluable record of contemporary France.

Saint Thomas (*sânt tŏm'ạs*), an island in the Gulf of Guinea, 150 m. N.W. of Cape Lopez, West Africa. It is part of the Portuguese colony of São Tomé and Principe and has an area of 319 sq. m. The products include coffee and cacao. The capital is São Tomé. Population, *ca.* 55,000.

Saint Thomas, an island in the West Indies, part of the Virgin Islands (*q.v.*). It is *ca.* 40 m. E. of Puerto Rico, has an area of *ca.* 30 sq. m., and is of volcanic origin (highest elevation, over 1,500 ft.). The industry includes tourism, truck farming, and the manufacture of rum and bay rum. Charlotte Amalie (pop., 1950, 11,469), on the south shore, is the capital. Saint Thomas Harbor at Charlotte Amalie is one of the best in the area. Discovered by Columbus in 1493, the island was settled by Europeans in the 17th century. Population, 1950, 13,813.

Saint Valentine (*sânt văl'ẹn-tīn*). See *Valentine.*

Saint Vincent (*sânt vĭn'sẹnt*), an island in the West Indies, a British colony which includes part of the Grenadines and is part of the Windward Islands, 100 m. W. of Barbados. It has an area of 150.3 sq. m. The soil is fertile, and arrowroot, copra, and sugar are the chief products. Sea-island cotton grown there is world famous. A range of volcanic mountains traverses the island from north to south; La Soufrière, an active volcano rising 4,048 ft., is the highest point. Originally inhabited by Carib Indians, the island was opened to settlers by Charles I of England in 1627 but was held by the French from 1779 to 1783. It is frequently visited by hurricanes. Kingstown (pop., *ca.* 6,338), in the southwest, is the capital. Population, 1955, 76,778.

Saint Vincent, CAPE, the southwestern extremity of Portugal, forming an extensive promontory in the Atlantic. Nearby, at Sagres, Henry the Navigator (*q.v.*) established his school of navigation. The waters off the cape have been the scene of several naval battles. The most important contest occurred there on Feb. 14, 1797, when the English under Sir John Jervis defeated the Spanish fleet and thus established British domination of the seas.

Saint Vitus's Dance (*sânt vī'tŭs-ẹz dăns*), or CHOREA, a disease of the nerves of motion, sometimes thought due to infection (associated with rheumatic fever, *q.v.*) and sometimes hereditary, causing the extremities and other parts of the body to move involuntarily. It is most common among persons between the ages of ten and 20 and is more frequent in females than in males. Usually, the patient becomes subject to a sense of awkwardness while in the presence of strangers, owing to sudden muscular contortions. Gradually, the muscles cease to be under full control of the will, except by a violent and painful volition. In many cases the hands move suddenly in an opposite direction from the one intended, while the face may be distorted by the spasmodic action of the muscles. All actions of the body become very uncertain.

Saïs (*sä'ĭs*), a city of ancient Egypt, on the Rosetta branch of the western Nile delta. It was long an important city of the lower Nile, and in the 8th century B.C. a king of Saïs, Tefnakht, dominated most of Middle Egypt. The rule of his son Bocchoris is regarded as the 24th Egyptian Dynasty (718-712 B.C.). The city regained importance in 664 B.C. when a Saite king established the 26th Dynasty of Egypt; although the seat of government was moved to Memphis, Saïs remained the royal residence throughout the existence of this dynasty (663-525 B.C.). The city was the site of temples to Neith, the city's patroness, and to Osiris. Little remains of the temples and the royal tombs which they contained, but several bronze statues of deities were found at Sa-el-hagar, a small village near Saïs.

Sake (*sä'kē*), the principal alcoholic beverage of Japan. It is a kind of beer, yellowish-white in color, brewed from rice and containing from 12 to 15 per cent of alcohol. Usually served warm, sake is said to taste somewhat like Madeira or sherry wine.

Sakhalin (*săk'ạ-lēn*), or SAGHALIEN, an island of the Russian S.F.S.R., off the east coast of Siberia, from which it is separated by the Gulf of Tatary and the Tatar Strait. To the north and east is the Sea of Okhotsk; and on the south it is separated from the Japanese island of Hokkaido by Soya Strait. Sakhalin is *ca.* 600 m. long and *ca.* 3 to 60 m. wide with an area of *ca.* 29,336 sq. m. The coastline is regular, with two large inlets, Aniwa and Taraika bays, located in the southeast. The surface is mountainous, with two major ranges, separated by a valley, running the length of the island. The highest peak is Mt. Lopatin (4,278 ft.). The coastal areas are generally narrow strips. Although it is somewhat warmer on the southern and eastern coasts, the climate is cold and foggy. Rainfall is abundant in summer; and severe storms and heavy snowfall mark the winter, which lasts from October to May. During the winter, the Tatar Strait freezes and may be crossed by dog sled.

Sakhalin Island has valuable forests, consisting chiefly of coniferous trees, extensive oil and coal resources, and deposits of iron and gold. Its major industries include mining, lumbering, farming, and fishing, which is carried on in the island's many short streams and along the coasts. The population comprises Russians, Japanese, and a minority of natives (Ainus, Gilyaks, and Oroks). The chief ports are Aleksandrovsk, on the west coast, and Okha, on the northeast coast.

The island was visited by Japanese and Russians in the 17th and 18th centuries and colonized by both in the 19th century. The Russians and Japanese disputed control of the island from 1853 to 1875, when Japan gave up her claim to the island in exchange for the Kurile Islands. By the treaty of Portsmouth (1905), however, Russia returned the southern half of the island (south of 50° N. lat.) to Japan; and the Japanese called their part of the island Karafuto. After the Russian Revolution (1917), Japan took over the northern part of the island and occupied it from 1920 to 1925, when it was returned to the U.S.S.R. The defeat of Japan in 1945 resulted in the annexation of the Japanese part of the island by the U.S.S.R., as had been provided for by the Yalta Agreement of 1945, and most of the Japanese population was repatriated to Japan. Population, *ca.* 400,000.

Sala (*sä'lą*), GEORGE AUGUSTUS, journalist and author, born in London, England, Nov. 24, 1828; died in Brighton, Dec. 8, 1895. Although he studied art, Sala very early became interested in writing, and, beginning in 1851, wrote articles and stories for two magazines edited by Charles Dickens. In 1856 Dickens sent him to Russia as a correspondent, thus launching him on a career as a columnist for various newspapers. As a correspondent for the London *Daily Telegraph*, he was in the U.S. in 1864 and in France during the Franco-Prussian War. In 1885 he toured the U.S. and Australia for the paper. In 1892 he founded *Sala's Journal*, but its failure resulted in heavy financial losses. His books include "My Diary in America in the Midst of War" (1865) and "Life and Adventures of George Augustus Sala" (1895).

Saladin (*săl'ą-dĭn*), sultan of Egypt and Syria, born in Tikrit, Mesopotamia, in 1138; died in Damascus, March 4, 1193. He was educated in Damascus, then the center of Moslem learning. He served (1164-74) in the armies of the Syrian ruler Nur-ed-Din (*q.v.*) in campaigns against Egypt. He became vizier of Egypt *ca.* 1169, deposed the Fatimite dynasty in 1171, and was proclaimed sultan in 1174, after Nur-ed-Din's death. In 1174 he marched against Syria and in 1175 was proclaimed sultan of Syria.

During the next 12 years, he consolidated his empire by conquests and by making improvements, such as the construction of canals, irrigation systems, citadels, colleges, and mosques. In 1187 he began his final campaign to conquer the Christian strongholds in Palestine and by 1190 had conquered all of the Christian areas, including Jerusalem, with the exception of Tyre on the coast. This possession permitted the Christians to land reinforcements, especially because Saladin had no fleet. In June 1191 King Richard I of England arrived in the Holy Land, at the head of the Third Crusade, and quickly laid siege to Acre, which surrendered in July. Other victories followed, but they were of no great consequence, and Saladin and Richard negotiated a peace settlement by which the Christian holdings in the Holy Land were reduced to the coastal strip, with free passage to Jerusalem. Both Saladin and Richard appear as characters in Scott's "The Talisman," in which the chivalrous character of both protagonists is set forth in a highly romanticized style. Saladin was a fiercely devout Mohammedan and yet was considerate of his prisoners and generous in his gifts and praise to Richard.

Salado (*sä-lä'THō*), the name of several rivers in Argentina, the most important being the Salado del Norte (Río del Juramento) which rises in the Andes Mts. at Salta; it flows for about 1,000 m. in a southeasterly direction to join the Paraná at Santa Fe. The name Salado is derived from the saline character of the rivers.

Salamanca (*săl-ą-măng'ką*), a city in Spain, capital of Salamanca province (area, 4,756 sq. m.; pop., 1955, 430,893), on the Tormes River, 107 m. N.W. of Madrid. It is an important railroad junction and a trade center for livestock and grains. Industries include flour milling and the manufacture of chemicals, and metal and wood products.

Salamanca was long a center of Spanish cul-

SALADIN

ture and learning and is noted for its old architecture. Among the principal landmarks are the university, founded in 1230 by Alfonso IX of León, two cathedrals of the 12th and 16th centuries, and a square designed for bull fights, large enough to hold a capacity crowd of 20,000.

The importance of Salamanca dates from 222 B.C., when it was captured by Hannibal. It was subsequently taken by the Romans, the Goths, and the Moors. The city suffered severe damage during the Peninsular War, when Lord Wellington defeated the French here on July 22, 1812. Population, 1955, 86,062.

Salamander (*săl′ą-măn-dẽr*), a class of amphibious animals related to the newts (*q.v.*) and resembling the lizard. Many species have been described throughout the world, but they are most common in North America. All have an elongated body, a long tail, and four legs. The young are usually born in the water, either alive or as eggs. They first breathe through gills, which some species retain throughout life; others take to the land and develop lungs or breathe through the surface of the skin. All species have a low body temperature and require cool surroundings. In the U.S., there are over 125 species of salamanders, including the Ozark blind variety, which dwells in dark caves or water, and the tiger, the redbacked, and the slimy. Throughout the world salamanders vary in length, from the pygmy of the U.S. (2 in.) to the giant of China and Japan, which measures up to 60 in. Salamanders feed on snails, slugs, worms, and insects.

Salamis (*săl′ą-mĭs*), or KOULOURI, a Greek island in the Saronic Gulf, 8 m. w. of Athens. It is the main base of the Greek royal navy, which, with fishing, provides the chief occupation of the islanders. It first became a part of Athens *ca.* 600 B.C. Salamis (pop., 1951, 7,757) is the main town. The total area is 36 sq. m.; population, 1951, 14,066.

Salamis, BATTLE OF, a celebrated naval engagement of the Persian Wars between the Greeks and the Persians, in 480 B.C. It occurred in the narrow strait between the island of Salamis and Attica and was fought shortly after the historic battle of Thermopylae (*q.v.*), which ended in a Persian victory. Xerxes commanded a large Persian fleet, and the smaller Athenian fleet was under the command of Themistocles and Eurybiades. The battle was a decisive victory for Athens and a turning point in the historic contest because it prevented further attempts by the Persians to mount large-scale sea or land attacks on Greek territory.

Sal Ammoniac (*săl ăm-mō′nĭ-ăk̦*), the chloride of ammonium, obtained from the refuse matter of gas works. It is found native in volcanic regions and may be produced in small quantities by adding hydrochloric acid to a solution of ammonia. Sal ammoniac is soluble in water, has a specific gravity of 1.45, and is bitter to the taste. It is used in medicine, in galvanizing iron, and in calico printing.

Salayar (*sȧ-lī′ẽr*), or SALEIER, a group of islands in the Malay Archipelago, situated a short distance south of Celebes. Salayar Island, the largest of the group, has an area of 250 sq. m., while the entire area is 295 sq. m. The islets included are Hog, Boneratta, and Kalaura. The group is of coral limestone formation and has a fertile soil. Tobacco, cotton, potatoes, indigo, fruits, horses, and ebony are the principal products. The inhabitants are chiefly Malays of the Mohammedan faith. Population, *ca.* 65,900.

Salazar (*sä-lä-zär′*), ANTONIO DE OLIVEIRA, statesman, born in Portugal, in 1889. In 1932, he became premier and finance minister, and the following year drafted a new constitution, revising the government along authoritarian lines. In 1936, he added the portfolios of war and foreign affairs to his other posts, becoming virtual dictator. He indirectly aided the U.S. in World War II by granting bases to the Allies in the Azores Islands (1943). See also *Portugal,* HISTORY.

Courtesy Massachusetts Development & Industrial Com.

HOUSE OF THE SEVEN GABLES

This home at Salem, Mass., was the setting for Hawthorne's novel. Six gables are visible; the seventh is on the far side

Salem (*sā′lęm*), a port city of Massachusetts, one of the county seats of Essex County, on Massachusetts Bay, 16 m. N.E. of Boston. It is served by the Boston & Maine R.R. The city is situated on a peninsula comprising about 8 sq. m. and carries on a trade in coal and oil. Among the manufactures are leather products, hardware, machinery, oils and greases, furniture, cotton goods, games, radios, and electrical equipment. Salem is the site of numerous historic landmarks and the birthplace of several great Americans, including Nathaniel Hawthorne, author of "The

Scarlet Letter," and Nathaniel Bowditch, eminent mathematician and navigator. Noteworthy buildings include the custom house, built in 1825; the House of Seven Gables (1669), which inspired Hawthorne's novel of the same name; Witch House (1675), home of one of the justices of witchcraft fame, the Pickering House, dating from before 1660, the Ropes Memorials, the Old Town Hall, the Salem Athanaeum, the Peabody Acad. of Science with its collection of East Indian relics, and the Salem State Teachers Coll.

The early history of Salem is linked with the famous "witchcraft trials," which were brought to a close in 1693 with a general "jail delivery." On Oct. 5, 1774, a provincial congress convened here and initiated the political revolution against Britain. For half a century after the Declaration of Independence Salem was an important maritime port, but her trade declined when the railroads began to build up the greater ports at the expense of the lesser, and large vessels were introduced, which could not enter her shallow harbor. Salem was founded in 1626, by Roger Conant, as a commercial venture. It was chartered as a city in 1836. Population, 1950, 41,880.

Salem, county seat of Salem County, New Jersey, 38 m. s.w. of Philadelphia, Pa. It is near the confluence of the Delaware and Salem rivers, on the Pennsylvania-Reading Seashore R.R. Salem was settled by Swedes in 1641, became a stronghold of Quakers under John Fenwick in 1675, and was incorporated as a city in 1858. Population, 1940, 8,618; in 1950, 9,050.

Salem, formerly a city of Forsyth County, North Carolina, 110 m. w. of Raleigh, on the Southern and other railroads. In 1913 it was united with Winston to form the city of Winston-Salem. It is the seat of many large tobacco firms. It was settled in 1766 and incorporated in 1850.

Salem, a city of Ohio, in Columbiana County, 70 m. N.W. of Pittsburgh, Pa., and 62 m. S.E. of Cleveland. Transportation is furnished by the Pennsylvania R.R. and numerous bus lines. It is surrounded by fertile agricultural country containing deposits of bituminous coal. The principal landmark is the Edwin Coppock Monument, commemorating a resident who was hanged for his part in the raid at Harpers Ferry instigated by John Brown (*q.v.*). Manufactures include kitchen and sanitary equipment, pumps, tools, couplings, dies, china, cold rolling mills, commercial furnaces, dairy products, flour and labels. The region was first settled in 1807 and has since won a place in history for its anti-slavery activity, the help it gave to John Brown, and the part played by the Quakers, its principal early settlers. Quaker influence is still visible in the architecture of the town and the character of its people. Salem was incorporated as a city in 1887. Population, 1940, 12,301; in 1950, 12,754.

Salem, the capital of Oregon, county seat of Marion County, on the Willamette River, 44 m. s.w. of Portland. It is on the Southern Pacific and Oregon Electric R.R.'s and is surrounded by fertile agricultural and dairying country. The noteworthy buildings include the state capitol and various other state office buildings, the old county courthouse, the state hospital, school for the blind, and penitentiary, the Jason Lee house, where Willamette Univ. was founded in 1842, and the site of the Jason Lee mill. Salem is the seat of Willamette Univ., the oldest college in the Pacific Northwest. Herbert Hoover lived in Salem as a boy. The manufactures include paper, lumber, linen goods, clothing, flax products, furniture, fertilizer, machinery, canned goods, food products, and earthenware. Salem was first settled in 1834 and incorporated in 1860. It has been the state capital since 1859. Population, 1940, 30,908; in 1950, 43,140.

Salem, a city of India, in the Madras presidency, about 125 m. s.w. of Madras, with which it is connected by railways. It is the capital of a government of the same name. It has a number of noteworthy temples, government buildings, and educational institutions. Among the manufactures are carpets, clothing, hardware, earthenware, and machinery. Population, *ca.* 125,000.

Salerno (*sä-lĕr′nô*), a seaport city of Southern Italy, on the Gulf of Salerno, 32 m. S.E. of Naples, with which it is connected by a railroad. The famous Univ. of Salerno was founded in 1150, but was abolished in 1817. The province of Salerno, of which the city of Salerno is the capital, is noted for its production of fruits and wine. During World War II, Salerno was captured by the American Fifth Army after successful Allied naval engagements had opened the port (Sept. 1943). Population, *ca.* 41,000.

Sales Tax (*sālz tăks*), in its broadest sense, a levy upon the gross selling price of substantially all commodities and services, whether the sales be intermediary or final. Ordinarily low price purchases (ranging from five to 25 cents) are exempted from the tax. Necessities such as food and medicine are sometimes exempted. Many states, however, have adopted modified sales taxes to supplement income during emergencies or periods of economic depression. With few exceptions these state sales taxes were retained as permanent measures. In addition to general sales taxes, numerous states have special taxes on the sale of a single commodity or a small number of commodities, such as tobacco, liquor, amusement tickets, etc.

Since 1929, more than 30 states have tried sales taxes at one time or another, following the experiment instituted by the State of Georgia.

The *retail sales tax* generally consists of a 1 to

3 per cent levy upon the sales of tangible property at retail or for consumption. In some cases, the tax is extended to include such commodities and services as electric lighting, amusements and food. Approximately half of the states employ retail sales taxes.

The *general sales tax* of 2 to 3 per cent is imposed in a small number of states, where it applies to sales of tangible personal property both *at retail and for resale.*

The *gross receipts tax,* another little-used tax, imposes a levy of ¼ to 2 per cent on sales of personal, public, and professional services.

See also *Excise; Internal Revenue.*

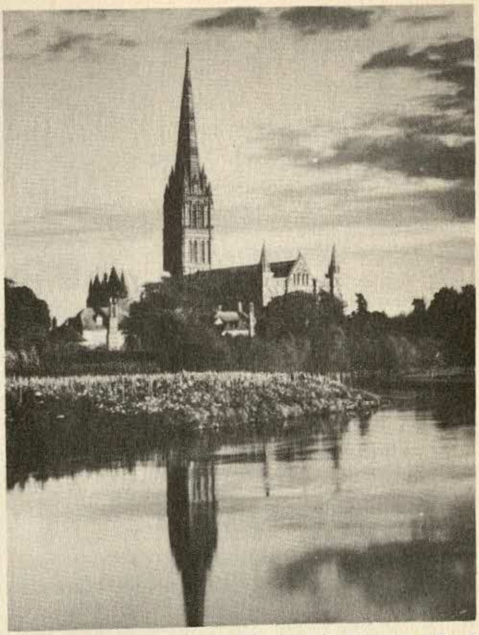
Salford (*sal′fôrd*), a town in England. See *Manchester.*

Salicin (*săl′ĭ-sĭn*), the glucoside of salicylic alcohol or orthohydroxybenzylglucoside. It exists in the bark of most species of willows and poplars, and an infusion of these barks was formerly used for treatment of acute rheumatic fever. The salicylic alcohol contained in the bark infusion oxidizes to salicylic acid in the body. Salicin has largely been superseded in common use by aspirin, which is acetyl salicylic acid.

Salic Law (*săl′ĭk*), the code of laws established by the Salian Franks. The name is applied particularly to one chapter of these laws, that in which succession to certain lands is limited to male heirs to the exclusion of females, chiefly because the possession of those lands implied certain military duties. The Salic Law was applied in France to the succession of the crown in the 14th century, thus excluding females from the throne.

Salicylic Acid (*săl-ĭ-sĭl′ĭk*), an organic acid found in many plants, but the best quality is obtained from wintergreen, in which it forms an essential oil. It is a compound of carbon, hydrogen, and oxygen and is obtained by distilling the flowers of some plants and the bark of others. It is found in combination with the volatile oil of betula in the bark of the sweet birch, in the flowers of the meadowsweet, and in the whortleberry. The taste is sweetish-sour and the properties are antiseptic and antiputrefactive. For commercial purposes it is manufactured either from the oil of wintergreen or from carbolic acid, but the latter is the most important product. It is used in the manufacture of certain dyestuffs, for the preservation of articles of food, and in some cases as a medicine. The foods preserved by this product include milk, eggs, fruits, and pickled vegetables. Antiseptic properties are not possessed by the salts of salicylic acid, but its sodium salt is used for medicine, especially in cases of acute rheumatism.

Salina (*sa-lī′na*), a city in central Kansas, seat of Saline County, on the Smoky Hill River, 89 m. N. of Wichita. It is served by the Union Pacific, Missouri Pacific, Atchison, Topeka & Santa Fe, and Chicago, Rock Island & Pacific R.R.'s; Salina Municipal Airport is 5.5 m. S.E. of the city. It is the seat of Kansas Wesleyan Univ., Marymount Coll., Christ Cathedral (Protestant Episcopal), and Cathedral of the Sacred Heart (Roman Catholic). Schilling Air Force and missile base is nearby. Points of interest in the vicinity include Kanopolis State Park and prehistoric Indian excavations.



Courtesy British Information Services, N. Y.

SALISBURY CATHEDRAL

Salina is a commercial center in an area producing livestock, grain, and dairy products. Its industries include flour mills, printing, construction, and the manufacture of electrical and optical products, sheet metal, feed, and diesel parts. Salina was settled in 1858 and incorporated in 1862. Population, 1950, 26,176; in 1960, 43,202.

Salisbury (*sôlz′bĕr-ĭ*), a city in northwestern North Carolina, seat of Rowan County, served by the Southern Ry. It is the seat of Catawba Coll. and Livingstone Coll. Salisbury produces textiles, foods, machinery, metal products, lumber and wood products, chemicals, and stone, clay, and glass products. In 1958 the city had a value added by manufacture of $19,622,000. Salisbury was founded in 1753 and incorporated as a village in 1755 and a city in 1770. Population, 1950, 20,102; in 1960, 21,297.

Salisbury, a city of England, in Wiltshire County, on the Avon River, 80 m. S.W. of London. It has convenient railroad facilities, manufactures of cutlery and clothing, and several public schools. A splendid cathedral, completed in 1258, is its chief building. It is 473 ft.

long and 111 ft. wide, and has a spire 400 ft. high. Salisbury has a bishop's palace and the Blackmore Museum, the latter containing noteworthy local antiquities. Among the manufactures are cutlery and clothing. Population, *ca.* 25,000.

Salisbury, ROBERT ARTHUR, MARQUIS OF, statesman, born in Hatfield, England, Feb. 3, 1830; died Aug. 22, 1903. He was graduated from Oxford Univ. In 1853 he entered Parliament for Stamford as a Conservative and in 1868 was created a marquis. He was known as Lord Robert Cecil in the House of Commons until 1865, when he assumed the title of Viscount Cranborne. In 1866 he became Secretary for India, a position he resigned in 1867, but was again appointed in 1874. In 1878 he was made Secretary of Foreign Affairs. In the same year he and Disraeli attended the Congress of Berlin as representatives from Great Britain. His party sustained a defeat in the election of 1880, but he succeeded Disraeli as leader of his party in the House of Lords, and as such opposed Gladstone's Irish policy. When the government of Gladstone fell, in 1885, Salisbury succeeded him as premier. He resigned in the same year but was again elected in 1886. The Conservatives were defeated in the general election of 1892, and he resigned, but with the success of that party in 1895 he again came into power. He was married to Georgina Alderson in 1857, a lady of considerable ability and influence, who died Nov. 20, 1899. Salisbury became chancellor of the Univ. of Oxford in 1869 and was otherwise accorded distinguished honors.

MARQUIS OF SALISBURY

As leader of his party and nation during the crucial years that rounded off the 19th century, Lord Salisbury is associated with the policy of imperialism that culminated in the South African War.

Saliva (*sȧ-lī′vȧ*), the thin, colorless liquid secreted in the mouth by the salivary glands, which serves to keep the mouth in a moist condition and aids mastication by mixing with the food. There are three pairs of salivary glands, known as the parotid, submaxillary, and sublingual. The *parotid glands* are seated on the sides of the face, between the ear and the lower jaw; the *submaxillary*, beneath the horizontal part of the lower jaw; and the *sublingual*, beneath the tongue. They consist of numerous lobes and lobules, which are connected by vessels, ducts, and areolar tissue. The product secreted is conducted to the mouth by ducts. The amount varies, but the usual quantity is about three pounds per day, and in health it is always sufficient to keep the mouth moist. It contains but a small proportion of solids. Besides serving to moisten the food, it assists in mastication and swallowing, and its peculiar organic principle, called *ptyalin*, acting upon the starch of the food, begins the process of changing it into glucose or grape sugar. Some mammals are destitute of salivary glands, and so also are some reptiles and most fishes.

Salk (*sa̤k*), JONAS EDWARD, physician, biochemist, born in New York City, Oct. 28, 1914. After graduation from New York Univ. Medical School (1939), he went to the Univ. of Michigan, where he worked on the development of influenza vaccines. In 1947 he became director of the Univ. of Pittsburgh virus-research laboratory. In 1949 he was assigned by the National Foundation for Infantile Paralysis to verify findings that there were three types, rather than one, of polio virus. He developed (1953) an antipolio vaccine, using a culture broth developed by Dr. Raymond C. Parker. After nationwide tests, the vaccine was ready for general use in 1955. Dr. Salk received no financial reward from his vaccine, but he did receive some awards and a Presidential citation. See also *Infantile Paralysis*.

Sallust (*săl′lŭst*), GAIUS SALLUSTIUS CRISPUS, Roman historian, born at Amiternum, in the Sabine country, in 86 B.C.; died in 34 B.C. He became a tribune of the people in 52 B.C., quaestor in 49 B.C., and praetor in 46 B.C. He cast his lot with Julius Caesar, whom he later accompanied to Africa. He was made governor of Numidia, where he greedily enriched himself. After returning to Rome, Sallust occupied himself in historical research. His principal works include "Catalina," or *"Bellum Catilinarium,"* and "Jugurtha," or *"Bellum Jugurthinum."* Of his history of Rome from 78 to 66 B.C., only fragments are extant.

Salmagundi (*săl-mȧ-gŭn′dĭ*), a semi-monthly publication issued by Washington Irving (*q.v.*) in collaboration with his brother William, and

James Kirke Paulding. The paper was noted for its humorous essays centering around New York City.

Salmon (*săm'ŭn*), the common name of a class of food fishes which belongs to the genus *Salmo*. They are common to both salt and fresh waters and are particularly abundant in the North Atlantic. A number of well-marked species have been described, all of which are among the most important marketable fishes, but those of the North Atlantic are most widely distributed, ranging north of New York in America and north of Spain in Europe. The usual length of the common salmon is from 3 to 4 ft. and the general weight ranges from 15 to 30 lbs., but specimens weighing 50 and even 75 lbs. are not rare. The color of the adult fish is a steel blue on the back and head, variegated with grayish or blackish spots, and merging into silvery-white beneath. The flesh has a delicate reddish-orange color. It feeds on animal matter, particularly on minnows, small fish, and herring, but its food varies somewhat with the locality which it frequents. The salmon cannot be said to belong exclusively to either the marine or the fresh-water fishes, but its natural home is near the mouths and estuaries of the larger rivers. However, there are marine species that inhabit the deeper parts of the ocean and a species occurs landlocked in certain lakes in Maine, New York, and New Brunswick.

It is thought that the salmon obeys a natural instinct in migrating from the sea to spawn in the rivers. This migration occurs annually in the autumn, and, after remaining for some weeks in the stream, both male and female return to the sea. This migratory instinct is so great that rapids and waterfalls are no material obstacle against its advance toward the heads of rivers. Salmon have been seen to leap a height of 16 ft. and, failing to surmount the difficulty, to try again and again. They possess a peculiar ability to suspend themselves and move upward in the falling water by a switch of the tail. The eggs are deposited in furrows made by the female in the gravel lying on the bed of the river, where they are covered by sand moved by means of the tail. Many of the eggs are carried away by the running water or eaten by trout and wild fowl, but these losses are compensated for by the immense fertility of the fish, many hundreds of eggs being deposited by a single female. The eggs hatch in a period ranging from 70 to 140 days. The young fish in its embryo state resembles a tadpole, being only about ⅝ in. long and having a portion of the egg suspended below its body, which serves as food for several weeks. By the seventh week it has grown sufficiently to assume the form of a small fish an inch in length, and it begins to swim about in search of food.

The young salmon before its migration seaward is called a *parr*. In that stage it ranges from 3 to 8 in. in length. When from one to two years old, it begins to assume a brilliant silvery hue and the fins become darker. It is now called a *smolt*, or *salmon fry*, gathers in groups of from 40 to 75, and begins to move slowly toward the sea. On reaching brackish water, the salmon remain at rest for a short time, but soon take to the sea, where their life is unknown. It has been observed that their growth in the open sea is remarkably rapid. A smolt weighing 2 oz. has been found to attain a weight of from 6 to 10 lbs. within a few months. After remaining about three months in the open sea, they return to fresh water weighing from 4 to 6 lbs. and are known as *grilse*, or *salmon peel*. They are capable of depositing eggs when in the grilse state and usually spawn shortly after reaching fresh water, but return soon after to the open sea to develop into the adult salmon. After a second stay in the ocean, a period usually of several months, the salmon return to the fresh water, generally seeking the place of their birth. It is while they move from the sea to the spawning grounds that they are caught in large numbers.

The annual catch of salmon on the entire Pacific coast of the U.S. and the Dominion of Canada is valued at several million dollars. Salmon fisheries of importance are found in the Elbe, Tay, and many other rivers of Europe north of Spain. The salmon common to the North Atlantic is generally known as *salmon salar*, and differs from the species found in the waters of Northwestern America. The salmon of North America include species known as *dog salmon, chinook* or *king salmon, chum* or *keta salmon, silver salmon, blueback salmon, humpback salmon*, and *salmon trout* or *steelhead*. The salmon is eaten fresh and in a cured state, but in many regions the canned salmon is consumed most extensively.

Salmon Trout (*săm'ŭn trout*). See *Trout*.

Salol (*săl'ōl*), a white crystalline powder used as a medicine, frequently called *salicylate of phenol*. It is tasteless and odorless, is insoluble in water, but is soluble in ether, alcohol, and chloroform. It does not dissolve when taken into the stomach, but is dissolved in the duodenum by the alkaline pancreatic juice. As a medicine it is useful in treating rheumatism. It is prescribed as an intestinal antiseptic in cholera and other disorders of the alimentary canal.

Salome (*sȧ-lō'mē*), in the New Testament, the daughter of Herodias and granddaughter of Herod the Great. At a celebration at the court of her stepfather, Herod Antipas, Salome danced so beautifully that Herod promised her anything she desired. She asked for the head of John the Baptist, who was thereupon decapitated. The story of Salome has often been portrayed in

SALOME

Painting by Bernardino Luini (1475-1532)

Italian, Dutch, and German painting and was the theme of a poetic drama by Oscar Wilde (1893) upon which was based the one-act opera by Richard Strauss (1905).

Salon (*sȧ-lôn′*), the name of an annual exhibition of works of art in Paris, France, in the months of May and June. It is held in the Grand Palais and is open to living artists of all nationalities. The exhibits consist of engravings, etchings, paintings, pastels, sculpture, and water colors. When the works of art are received at the Salon, they are examined by a jury of experts to determine whether they are worthy of being exhibited. The same jury determines the distribution of medals and the *Prix de Rome,* which is held in high esteem. This institution dates from 1607, when exhibitions began to be made at the Palais Royal, but two years later it was transferred to the Salon Carré of the Louvre. It was transferred to present quarters in 1855. Although the Salons were not held during World War II, they have since been revived.

Salonika (*sä-lô-nē′kȧ*) or THESSALONIKE or THESSALONIKI, a seaport of Greece, administrative center of Thessalonike (*q.v.*) department in Macedonia. It is located on the northeastern coast of Greece at the head of the Gulf of Salonika, which provides an excellent harbor. With extensive railway connections, it carries on a thriving trade, exporting grain, silk cocoons, tobacco, opium, manganese, and chrome. Architecturally it exhibits a Byzantine influence in some of its older churches, including the church of St. Sophia (which is similar to Hagia Sophia mosque in Istanbul) and the church of St. George. Some traces of structures from still earlier times are extant, including a triumphal arch of the late Roman period, but most of its ancient architecture is known today from descriptions by early writers.

The first city on the site of Salonika was known as Therma, named for nearby hot springs, and by this identity it is mentioned in connection with Xerxes' invasion of Greece. Cassander, a king of Macedonia, rebuilt the city *ca.* 315 B.C. and named it Thessalonica (*q.v.*), from which its present name was derived. The city figures prominently in European history, having been an early center of the Christian church; to its people St. Paul addressed his Epistles to the Thessalonians (*q.v.*). An important stronghold of the Byzantine Empire, it was conquered by the Saracens in 904 and by Normans from Sicily in 1185. Capital of a kingdom created by a leader of the Fourth Crusade in the 13th century, it was taken by the Turks in 1430 and held by them until 1912, when it was surrendered to the Greeks. During World War I, British and French forces were based in Salonika to maintain contact with the Serbian army and provide for a flank attack against the Central Powers. During World War II it was taken by the Germans (1941) and retaken by Greece (1944). Population, 1951, 217,049.

Salt (*sǫlt*), or SODIUM CHLORIDE, often called COMMON SALT, a widely distributed mineral, a compound of two elements, sodium and chlorine (chemical symbol, NaCl). See also *Salts.*

Man has used salt as a seasoning and preservative for food for thousands of years; it has determined the location of communities and caused wars. Vital in balancing the body fluids, it is constantly present in the human body and in the bodies of animals. The average individual uses some 12 lb. of salt annually.

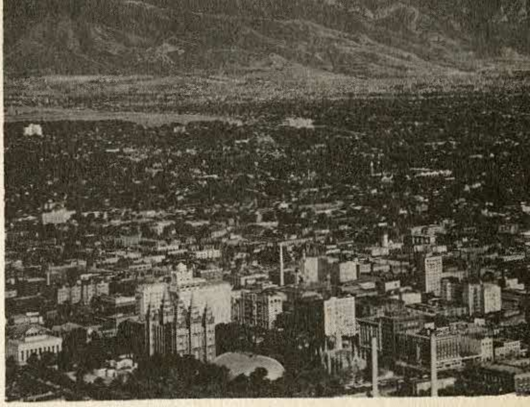
The world is rich in salt. It is gathered from deposits in the earth—salt beds in the U.S. lie as deep as 2,000 ft. below the surface—from brines, and from sea water. Natural brines include ocean water, brines below the earth's surface, and the waters of salt lakes. For many centuries, salt beds were exploited by dry mining, in much the same way as coal is mined. In comparatively recent times, however, well-drilling methods have been developed. Through shafts drilled into rock salt beds, water is run down to dissolve the underground salt, and the resulting brine is then pumped to the surface. This brine or natural brines may be evaporated artificially or by the sun; if by the sun, the brine is usually directed into special ponds built for the purpose. Modern salt-producing companies use a "vacuum" process for evaporating the brine, lowering the pressure to boil off the moisture more quickly. Salt is also found in an unusual phenomenon called a salt dome (because it has the general shape of a dome). The salt dome lies below the surface, with the mineral present in great thickness and in association, generally, with gypsum and anhydrite, and, in the U.S., with great oil pools.

The world production of salt outdistances demand. Some 35,000,000 tons are produced annually, with the U.S., Great Britain, China, Germany, France, and India taking high rank in its output. The U.S., with its *ca.* 20,000,000 tons annually, produces *ca.* 2.5 times more than any of the others, and the larger part comes from salt wells. The leading salt-producing states are Michigan, New York, Ohio, Louisiana, Texas, California, Kansas, and West Virginia. Salt domes are found in Louisiana and Texas. In Canada, Ontario ranks first, but salt is found elsewhere in the country as well. In Europe, major deposits are found in Austria and in Poland. Salt is abundant also in certain inland waters, such as the Dead Sea and the Great Salt Lake (*qq.v.*).

Salt has some 14,000 uses; only about 4 per cent of U.S. output is sold for household purposes. Its major users include the chemical and food industries, and it is also used in metallurgy, textiles, refrigeration, agriculture, ceramics, and medicine. Secondary roads are often built with a salt-stabilized base, and salt helps in softening water, packing meat, and bleaching pulp for paper. Iodine is added to table salt, for use in regions where iodine is scarce, to help prevent simple goiter (see *Goiter; Thyroid*). In this form, it is known as iodized salt.

One of the earliest written references to salt occurs in the Book of Job (6:6) in the Old Testament of the Bible. The Bible as a whole has some 30 references to salt. The compound was known to even earlier peoples than the Jews of Biblical times, however; archaeologists suggest that it was used in Europe more than 4,000 years ago. Later, its importance led to the construction of a major Roman military road, the Via Salaria, over which salt was brought from the salt works at Ostia to Rome. Each Roman soldier was given a special salt ration or money to buy it; the money was known as *salarium argentum*, from which the modern word "salary" is derived. In certain parts of Africa, the mineral was used as currency, a practice which may still persist. So vital is salt that the problems of providing it have always had to be solved; indeed, the first patent issued in America (1641) was for a method of making salt, devised by Samuel Winslow of the Massachusetts Bay Colony.

Salter (*sạl'tẽr*), (JAMES) ARTHUR, 1ST BARON SALTER OF KIDLINGTON, economist, born in Oxford, England, March 15, 1881. Educated at Oxford Univ., he joined (1904) the Admiralty where he became an expert on shipping. This knowledge proved of great value during both World Wars when he served on boards controlling Allied maritime transport. In his many-sided career he has taught (Oxford Univ., 1934-44), done relief work (for UNRRA, 1944), been a member of the British cabinet (1951-53), and written a number of books, among which are "Allied Shipping Control" (1921) and "Memoirs of a Public Servant" (1961).



Courtesy Salt Lake City Chamber of Commerce

SALT LAKE CITY, UTAH

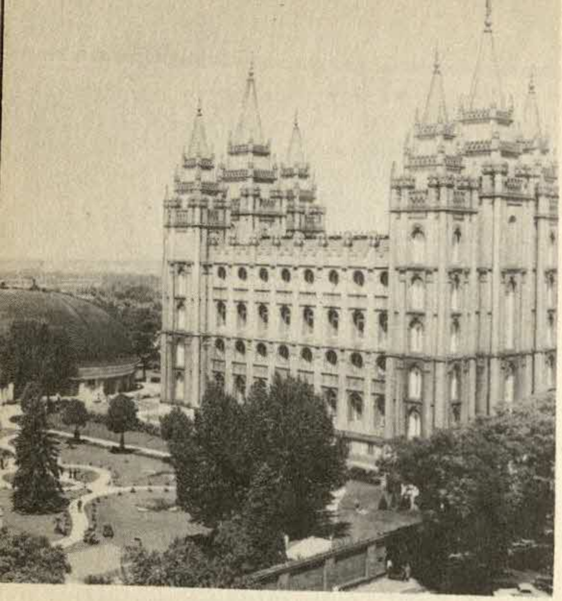
Air view of the downtown section, with the Wasatch Mts. in the background

Salt-Glazed Ware (*sạlt-glāzd wâr*). See *Chinaware*.

Saltillo (*säl-tē'yō*), a city in northeastern Mexico, capital of Coahuila State, *ca.* 50 m. s.w. of Monterrey, at an altitude of 5,000 ft. It is an important railroad junction and an agricultural, manufacturing, and mining center. Among the manufactures are clothing, flour, ceramics, and forest products. Saltillo was founded late in the 16th century. In 1847 the battle of Buena Vista (*q.v.*) was fought nearby. Population, 1950, *ca.* 69,800; in 1960, 99,101.

Salt Lake City (*sạlt lāk sĭt'ĭ*), a city in northern Utah, capital and largest city of the state, seat of Salt Lake County, 18 m. E. of the Great Salt Lake, in Great Salt Lake Valley. The city is 56.1 sq. m. in area and lies at an altitude of 4,357 ft. Salt Lake City is served by the Denver and Rio Grande Western R.R.; the Salt Lake, Garfield and Western Ry. (freight); the Union Pacific R.R.; and the Western Pacific R.R. Two airports are located 4 m. w. of the city, *ca.* 2.5 m. apart; both are municipally owned and one is used for the accommodation of smaller commercial and private aircraft.

DESCRIPTION: Salt Lake City's parks and playgrounds cover an area of more than 3,200 acres. Alta and Brighton, popular resorts located more than 25 m. from the city, in the Wasatch National Forest at altitudes over 8,000 ft., feature ski slopes with lifts and lodge accommodations, summer homes, etc. Pioneer Village, owned and operated by the Sons of the Utah Pioneers, covers



SALT LAKE CITY. TEMPLE SQUARE

five acres and includes authentic stores, blacksmith shop, apothecary, barber shop, schools, etc., going back to pioneer days. The Mormon Temple and Tabernacle are the most notable structures in the city. Others include the State Capitol, the Federal Building, the Roman Catholic Cathedral of the Madeleine, and the Episcopal St. Mark's Cathedral. Fort Douglas, in use by the U.S. Army, two veterans' hospitals, and various other Federal agencies are located in the city.

COMMERCE: Salt Lake City is an important banking center, including a branch of the Federal Reserve Bank of San Francisco. It is important as a livestock market as well as for extensive industries such as coking and smelting of copper, lead, silver, zinc, and iron, and the refining of oil, salt, and beet sugar. Manufactured products include clay, iron, steel products, and textiles. The standard metropolitan statistical area of Salt Lake City (pop., 1960, 383,035), which includes Salt Lake County, had a value added by manufacture of $203,744,000 in 1958, of which the city's industries produced $134,686,000.

EDUCATION AND CULTURAL INSTITUTIONS: Salt Lake City's public schools enroll *ca.* 42,000 pupils annually. Institutions of higher learning include the Univ. of Utah, Westminster Coll., business colleges, and trade schools. Among the city's cultural facilities are the Utah Symphony Orchestra and the world-famed Tabernacle Choir. Daily pipe-organ recitals are given in the Tabernacle. The Art Barn is a center for art and literary meetings, and there are several art galleries and drama groups.

GOVERNMENT: Salt Lake City has a commission form of government, with a mayor and four commissioners elected for four-year terms.

HISTORY: Salt Lake City was settled by a group of Latter-Day Saints known as Mormons (*q.v.*). Led by Brigham Young (*q.v.*), they arrived in Salt Lake Valley on July 24, 1847. At the time of its founding, the territory technically belonged to Mexico; it became part of the U.S. after the Treaty of Guadalupe Hidalgo (Feb. 2, 1848). Great Salt Lake City was incorporated in 1851 and was known by this name until 1868, when "Great" was dropped. In 1896, when Utah entered the Union as the 45th State, Salt Lake City became the state capital. The city was laid out and planned by Brigham Young and is known for its extraordinarily wide, straight streets.

POPULATION: The population was 8,236 in 1860 and grew to 53,531 by 1900. The greatest period of growth was between 1900 and 1910 (53,531 to 92,777). In 1950 the population was 182,121; in 1960, 189,454.

Salton Sea (*sạl′t′n sē*), a body of saline water, *ca.* 30 m. long and 8 to 14 m. wide, in Imperial and Riverside counties, in southeastern California. Lying *ca.* 240 ft. below sea level at its surface, the Salton Sea has no outlet. Although it loses water through evaporation, the size of the sea is maintained through the addition of drainage and waste water from the irrigated areas of the Imperial Valley. The basin containing the sea was part of the prehistoric floor of the Gulf of California. The waters at the head of the gulf were sealed off by silt from the Colorado River, thus creating ancient Lake Cahuilla. The old lake dried up gradually, leaving what was known as Salton Sink, a salt-covered depression about 280 ft. below sea level, which was subject to periodic flooding by the Colorado River. In its modern form, Salton Sea was created (1905-07) when the Colorado broke through an inadequate levee and filled the Salton Sink with water, covering an area of *ca.* 450 sq. m. to a maximum depth of *ca.* 67 ft. The levee was replaced and the flood was stopped in 1907. Since then, modern flood-control works have been installed along the Colorado.

Saltonstall (*sạl′t′n-stạl*), LEVERETT, politician, born in Chestnut Hill, Mass., Sept. 1, 1892. After receiving his LL.B. degree from Harvard Law School in 1917, he served in World War I. He was admitted to the Massachusetts bar in 1919. Saltonstall began his public career as a member of the board of aldermen of Newton, Mass., in 1920 and was chosen assistant district attorney of Middlesex County the following year. He was a member of the Massachusetts house of representatives, 1923-36, serving as speaker for his last seven years in office. While governor of Massachusetts (1939-44), he won election to the U.S. Senate to fill an unexpired term and was reelected in subsequent elections. He is noted for his liberal stand on civil rights and on international cooperation.

Saltpeter (*sạlt′pē-tẽr*), or NITER, KNO_3, POTASSIUM NITRATE, a white crystalline substance when purified. It is obtained in nature where the action of nitrifying bacteria fixes the atmospheric nitrogen in the presence of limited amounts of water, organic matter, and an alkaline condition. If nitrogenous compounds are present in the organic matter, other bacteria cause the oxidation to nitrates.

Vast deposits of soda niter or sodium nitrate occur in the caliche soils of Chile and Peru. These are extracted and the sodium nitrate is crystallized. To produce saltpeter or potassium nitrate, the sodium nitrate is mixed with a solution of potassium chloride of carbonate, causing an interchange of ions with the sodium compounds. Differences in solubility of the sodium and potassium compounds permit the preparation of the pure potassium nitrate and removal of the sodium chloride or bicarbonate.

Nitric oxides, obtained from the synthetic fixation of nitrogen from the air, can also be neutralized by potash to produce potassium nitrate or saltpeter. Synthetic ammonia is also oxidized directly to nitric acid which may then be neutralized with potash and the resulting potassium nitrate is formed by crystallization. It is used with common salt and sugar in curing meat, as an oxidizing agent, in glass making, in metallurgical operations, in the manufacture of gunpowder, and in pyrotechnics. It has an important place in pharmacy. Native nitrate of soda is valuable as a fertilizing manure, for which purpose large quantities are shipped from Chile and other South American ports.

Salts (*sạlts*), in chemistry, a name applied to compounds formed by the action of acids upon bases. In some salts, one atom of hydrogen is replaced by one atom of a univalent element; these include potassium nitrate, silver chloride, and sodium chloride (see *Salt*). Other salts are formed when one atom of a bivalent base-forming element is exchanged for two atoms of hydrogen, creating such compounds as zinc chloride and barium nitrate. There are many acid salts, such as sulfate of iron (green vitriol), which is formed by the union of sulfuric acid and iron. See also *Chemistry*.

The name *smelling salts* is used for a preparation of carbonate of ammonia mixed with fragrant, volatile oils. Products of this kind were formerly widely used to diffuse sweet scents (as for killing unpleasant odors), or to restore persons who suffered from faintness; at present they have almost vanished from common use. Their pungency was provided by the ammonia, while the pleasing scents were derived from various oils, such as the oils of cloves, lemon, bergamot, and lavender. In the 18th and 19th centuries highly decorative bottles, frequently filigreed with precious metals, were provided for these salts; they occupied much the same place among a lady's portable objects that the compact does today.

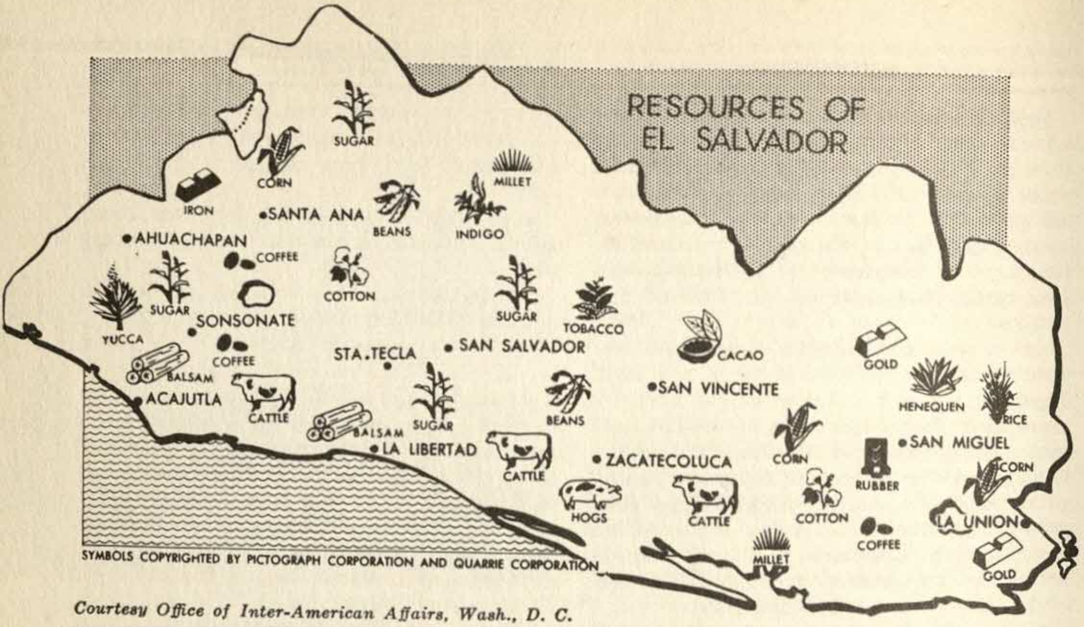
In popular usage, the term salts refers to *Epsom salts,* a moderately pleasant-tasting saline purgative.

Saltus (*sạl′tŭs*), EDGAR EVERTSON, author, born in New York City, June 8, 1858; died July 30, 1921. He was graduated from St. Paul's School at Concord, N.H., and later attended the Sorbonne and the Univs. of Munich and Heidelberg. In 1880 he was graduated from the Columbia Law School, and soon turned his attention to literary work. His chief publications are works of fiction, though he also wrote on biographical and philosophical topics. Among his publications are: "Anatomy of Negation," "Philosophy of Disenchantment," "When Dreams Come True," "Truth About Tristrem Varick," "A Transaction in Hearts," "A Story Without a Name," "Imperial Purple," and "The Pace That Kills." His brother, *Francis Saltus Saltus* (1849-89), wrote "Honey and Gall" and several volumes of poetry.

Salute (*sȧ-lūt′*), a military and naval mark of respect for a distinguished or official personage. A hand salute, in which the right hand is raised smartly above the right eye, is used by military personnel in greeting someone of higher rank. The fascist salute consisted of the simple extension of the right arm at a 45-degree angle, palm down. To honor visiting governmental dignitaries cannon are fired. The U.S. government has a standard formula for cannon salutes: the national salute of 21 guns is the salute for the national flag, the President of the U.S., presidents of foreign republics, or sovereigns visiting the U.S. The Vice President of the U.S. and American and foreign ambassadors are saluted with 19 guns.

Salvador (*săl′vạ-dôr*), REPUBLIC OF EL, the smallest Central American state, situated southwest of Honduras. It is 140 m. in length, east to west, and has an area of 8,164 sq. m. Much of the surface is gently undulating, but there are ranges of volcanic mountains traversing the central part, with peaks ranging from 3,500 to 9,000 ft. above sea level.

DESCRIPTION. The Pacific coast is a generally level plain, from which valleys extend along the streams to the boundary of Honduras and Guatemala, and a considerable valley region extends through the northern part. The western boundary is formed by the Santiago River and along the southeastern coast is the Gulf of Fonseca, a large inlet from the Pacific. The drainage, in general, is toward the south. The chief river is the Lempa, which is navigable a short distance, and the principal inlet is Jiquilisco Bay. The soil is remarkable for its fertility.



RESOURCES OF EL SALVADOR

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Courtesy Office of Inter-American Affairs, Wash., D. C.

INDUSTRIES. The climate and rainfall are favorable to the production of cereals, grasses, fruits, and vegetables. Agriculture is the chief industry, but comparatively large interests are vested in mining. Coffee is, by far, the country's outstanding product; others include sugar, indigo, tobacco, balsam, maize, and timber. The mineral deposits include gold, silver, iron, copper, mercury, and coal. Cattle, horses, mules, and sheep are raised in abundance. A large part of the trade is with Great Britain and the U.S.

GOVERNMENT. Salvador is divided into 14 departments and the government is modeled after that of the U.S. The president is elected for a term of four years and has the assistance of a cabinet of four ministers. Legislative authority is vested in a congress of 42 representatives, elected by popular vote for terms of one year, and the judicial power is vested in a supreme court and a system of inferior courts. The standing army numbers about 1,800 officers and men, but in time of war military service is compulsory for all men between 18 and 50 years of age. The navy is not of material importance, including only a few ships and gunboats. Education is free and attendance at elementary school is compulsory. There are high schools, two normal schools, and a university with faculties of law, medicine, science, and engineering.

GENERAL. The country has about 400 m. of railroad, all owned by British and American interests. About 2,300 m. of highways have been constructed, of which about one-third is suitable for motor travel. A 1,350-ft. suspension bridge across the Lempa River was completed in 1942. Spanish is the spoken and official language. Roman Catholicism is the preponderant religion. Salvador is the capital and largest city. Other cities include Santa Ana, San Miguel, Nueva San Salvador, San Vicente, and Sonsonate. A large proportion of the inhabitants are natives and mixed races, and the total population is about 1,700,000.

HISTORY. Salvador was long known as Cuscatlan. It was conquered for Spain by Pedro de Alvarado in 1525. It became independent from that country in 1821, when it joined the Mexican confederation, but became an independent republic in 1839. The present constitution was adopted in 1939. Salvador is the most densely populated republic of Central America, but its material progress has been retarded considerably by local dissensions and revolutions. The people have generally opposed the proposition to form a union of the Central American states. The country did, however, demonstrate its support of hemispheric solidarity by declaring war against Japan (Dec. 8, 1941) the day following the latter country's attack on Pearl Harbor. In October 1944, a dictatorship was established when Col. Salinas seized power after the fall of President Menandez, who had gained control following the resignation of President Martinez in May 1944. In January 1945, Gen. Salvador Castro was elected president. An Army revolt in December 1948 overthrew Castro and placed the nation under a military junta headed by Lt. Col. Manuel de Jesus Cordoba. Salvador ratified the charter of the United Nations on July 10, 1945. See also *Pan American Union.*

Salvage (*săl′vĭj*), in maritime law, the compensation allowed for saving a vessel or cargo from shipwreck, capture, or fire, or for recovering the vessel, cargo, or other property after it has been lost or sunk.

Salvarsan (*săl′vẽr-săn*), arsphenamine, more commonly called "606" from the fact that it was the 606th preparation tested by Paul Ehrlich (*q.v.*) and Sahachiro Hata in a series of researches to find an arsenical compound which would have the minimum effect on humans and the maximum toxicity toward spirochetes, trypanosomes, and similar parasites. It is an arsenic-linked, double molecule of para phenol, meta amino, arsenobenzene, with the composition $(OH \cdot C_6H_3(NH_2 \cdot HCl)As)_2$. Before the discovery of salvarsan, atoxyl, an arsenic derivative of aniline, had given feeble but promising results, but salvarsan provided the first effective treatment for syphilis. See also *Neoarsphenamine*.

Salvation Army (*săl-vā′shŭn är′mĭ*), an international organization formed in England by William Booth in 1865, whose mission is the salvation of mankind by spreading the Gospel. In this work he was assisted by his wife, both of whom had formerly been members of the Methodist New Connection. After conducting a mission in the East End of London, at which many unfortunates were changed into earnest converts, the mission was reorganized and called the Salvation Army, and by this name it has been known since 1878. The purpose of the Army is "the salvation of mankind from all forms of spiritual, moral, and temporal distress." Military phrases were generally adopted, the leader being called a *general;* evangelists, *officers* of different grades; and candidates, *cadets.* The uniforms differ according to the customs of a country, but are quite similar in the U.S., Australia, and the countries of Europe, while in parts of Asia red or white garments are most prevalent. Everywhere the army prepares a map on which the country is represented in districts and each section is placed under the charge of a *major.* This officer is assisted by one or more corps under a *captain,* who is assisted by *lieutenants.*

The army was both applauded and opposed from the first, but has succeeded in winning a large following, everywhere practicing self-denial and coming in touch with the common people. Both men and women wear characteristic uniforms, the latter being distinguished principally by poke bonnets with red trimmings, and parade the streets with banners, drums, timbrels, and songs. Crowds are induced to assemble at convenient places, and after a brief service the parade is conducted by the leader to the church or hall, where the services are continued. Members are pledged to temperance, unselfish lives, and belief in the Bible, and each is encouraged to give glad obedience and lead a spiritual, enthusiastic, Christian life. No distinction is recognized between the sexes as to rank, duty, or opportunity, and all persons are welcome to membership with a spirit of good cheer and devotion.

The army made its first appearance in France in 1880 and in the same year began its crusade in Canada and the U.S. Ballington Booth took charge of the American branch in 1883, but in 1896 organized a separate society known as *The Volunteers.*

In the U.S. there are over 1,500 corps and outposts, 4,980 officers and cadets, and about 425,000 members. It maintains relief stations, hotels, homes, hospitals, employment bureaus, canteens, club-rooms, and a number of educational institutions. The Army operates in 97 countries and colonies and its work is conducted in about 102 different languages. The *War Cry* is its principal publication. It is issued in English, but there are editions in French, German, and Swedish in New York City. Other periodicals include *The Young Soldier, Conqueror, Harbor Lights,* and *Social News.* General Booth published "In Darkest England." *Bramwell Booth,* son of William Booth, became commander-in-chief of the Salvation Army in 1912, succeeded by Gen. Edward J. Higgins in 1928. *Evangeline Booth* was general, 1934-39, when she was succeeded by George L. Carpenter. He was succeeded by Albert Orsborn in 1946. The Army was especially active in services for the armed forces and needy civilians during World War II. After the war the Army devoted much activity to relief and rehabilitation in war-torn countries.

Salvini (*säl-vē′nē*), TOMMASO, tragedian, born in Milan, Italy, Jan. 1, 1830; died Jan. 1, 1916. He studied in Milan and, after securing a liberal education, became connected with the Royal Theater at Naples. In 1849, he took part in the Italian Revolution, but soon returned to the stage. His greatest success was attained on the 600th anniversary of Dante's birth, which was celebrated at Florence in 1865, when he took the part of *Lancelotto* in the tragedy, "Francesca di Rimini." He visited the U.S. in 1875 and in 1881, both times with marked success. It may be said that his success rested on his perfect elocution and dramatic power, but these were re-enforced by noble bearing and splendid physique. He retired from the stage in 1884 to take up his residence in Florence. His chief parts were *Saul, Hamlet, Orosmane,* and *Othello.* King Victor Emmanuel conferred upon him the honor of knighthood. His son, *Alexander Salvini* (1861-96), is likewise noted as an actor.

Salween (*săl′wēn*), a river of Asia. It rises in Central Tibet and, after a general course of 800 m. toward the east and south, flows into the Gulf of Martaban, an inlet from the Indian Ocean. Several lakes are in the upper course, but in some places it flows through steep cliffs, and the valley is fertile. Rapids obstruct navigation, but steamboats ascend as far as Moulmein, to which place large quantities of teak and other timber are floated. The basin of the Salween includes 62,750 sq. m.

Salzburg (*zälts′bŏŏrk*), a city of southern

Courtesy Brown Bros., N. Y.

VIEW OF SALZBURG

Austria, in the province of Salzburg (area 2,762 sq. m.; population, *ca.* 250,000), on the Salzach River, 62 m. S.E. of Munich, Germany. It occupies a beautiful site on both sides of the river, which is crossed by several bridges. Among the buildings of note is the Castle of Hohen-Salzburg, dating from the 11th century. During the Middle Ages it was the seat of archbishops, who held the rank of princes of the German Empire. Salzburg has a fine cathedral, numerous hospitals and educational institutions, and a statue of Mozart, who was born here. The manufactures include musical instruments, clothing, pottery, and machinery. The surrounding country is highly fertile. The city is one of the most beautiful in Austria, to which it has belonged since 1814. Following World War II it was in the U.S. Zone of Occupation. Population, *ca.* 65,000.

Salzburg Festivals (*zälts′bŏŏrḳ fĕs′tĭv-ạlz*), musical and artistic festivals held in the town of Salzburg, Austria, birthplace and home of Mozart. Shortly before the end of World War I, a group of Austrian and German writers, actors, and musicians inaugurated the idea of the *Salzburger Festspielhaus Gemeinde* (Salzburg Festival Community), with Max Reinhardt (*q.v.*) and Richard Strauss (*q.v.*) as the main promoters. Hugo von Hofmannsthal's "Everyman" was produced by Reinhardt on the square before the cathedral as a feature presentation. A theater, the *Festspielhaus*, was opened in 1926 to house the world-famous music festivals which took place in Salzburg every summer until the occupation of Austria by Germany in 1938. The Festivals were once again revived in August 1946.

Samar (*sä′mär*), an island of the Philippines, situated S.E. of Luzon, from which it is separated by the St. Bernardino Strait. It has an area of over 5,000 sq. m. The coast line is indented by many gulfs and bays and the surface is more or less mountainous. The soil is remarkable for its fertility. It has vast forests of valuable timber and mineral deposits of considerable value. Horses, cattle, and swine are raised. Among the principal products are timber, palm oil, rice, tobacco, hemp, cocoa, and fruits. Catbalogan (population 6,072), is the capital. Population, *ca.* 380,000.

Samara (*sȧ-mä′rȧ*), a city of Russia. See *Kuibishev.*

Samarang (*sä-mȧ-räng′*), a seaport of Java, on the northern shore, 255 m. S.E. of Batavia. It is the third city of the island in population and commercial importance. The city has a good harbor, which has been improved by the construction of docks and wharves. It is the seat of a growing trade in coffee, tobacco, rice, sugar, indigo, and fruits. A railroad line has been built inland. The inhabitants consist largely of Malays, Arabians, and Chinese. Before World War II there were a number of European business and professional men, who maintained churches, schools, and several institutions of higher learning. The part of the city occupied by the Europeans has well-improved streets and modern facilities. Taken by the Japanese in 1942, the city was recaptured by the Allies in 1945. During the revolt of the Indonesians the British occupied the city in October and again in November 1945. Population, *ca.* 160,000.

Samaria (*sȧ-mâ′rĭ-ȧ*), an ancient city of Palestine, the capital of Israel from the time of Omri to the fall of the kingdom. It occupied a steep hill, called Shomeron, in the center of Palestine, and was so named because the hill resembled a watch mountain. We read in 1 Kings, 16:23-24, "And he [Omri] bought the hill Samaria of Shemer for two talents of silver, and built on the hill, and called the name of the city which he built, after the name of Shemer, owner of the hill, Samaria." It is thought the purchase was made in 925 B.C., when Samaria became the seat of government. It was unsuccessfully besieged by the Assyrians in 872 B.C., but Shalmaneser, King of Assyria, captured it in 721 B.C., after a siege of three years. About that time Sargon succeeded Shalmaneser and carried the Hebrews into Babylonian captivity, while their own lands were occupied by colonists from Assyria.

From the Jews remaining in Samaria and the Assyrian colonists descended the Samaritans, a powerful religious sect. Though embracing the religion of Israel, they were refused permission to aid in rebuilding the temple at Jerusalem, and accordingly built a rival temple on Mt. Gerizim in 409 B.C. Henceforth the two classes were at enmity with each other, which ultimately ended in a war and the destruction of Samaria under John Hyrcanus, a Jewish leader, in 109 B.C. It was made a Roman colony in the 3d century, but declined after the Mohammedan conquest, and on its site is the small village of Sebustieh. The Samaritans still exist as a religious sect, but differ from the Jews in that they reject the traditions and hold only to the Pentateuch, of which they possess their own version.

Samaritans (*sȧ-mâr′ĭ-tănz*). See *Samaria.*

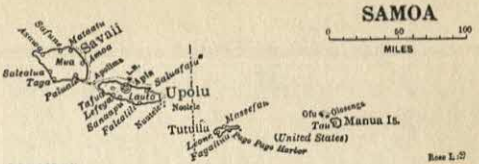
Samarium (*sȧ-mā′rĭ-ŭm*), a rare earth element. Its atomic number is 62, and its atomic weight 150.43. In 1932, Hevesy and Pohl discovered that it is slightly radioactive, emitting alpha particles. No specific use for it has been found.

Samarkand (*săm-ẽr-ḳănd′*), a city of Asiatic Russia, in the Uzbek Socialist Soviet Republic, 128 m. E. of Bokhara. It is situated on the Transcaspian R.R. and is surrounded by a fertile plain. The noteworthy buildings include three sacred colleges, situated in the center of the city, and the palace of the emirs of Bokhara, which has been converted into a hospital by the Russians. The old section of the city still contains interesting old relics, winding streets, and 14th-century architecture, noted for its symmetry and exquisite enameled tiles. Here, also, is the dome-crowned tomb of Timur (Tamerlane), the Mongol conqueror. It has a considerable trade in cereals, rice, leather, wine, and fruits. The manufactures include woolen and silk textiles, pottery, clothing, leather, utensils, and machinery. Samarkand was captured by Alexander the Great while on his march to Southern Asia. It became a sacred Moslem city after it was captured by the Arabs in 712 A.D. The city was nearly destroyed by Genghis Khan in 1219. In the 14th century it was made the capital of the great empire of Tamerlane, when it had a population of 150,000. The Russians annexed it in 1868. Since that time it has gained increasing importance. Population, *ca.* 135,000.

Samba (*săm′bȧ*), a dance of Brazilian origin, which became popular in the U.S. during the early 1940's.

Samnites (*săm′nīts*), the name of several tribes who occupied a part of ancient Rome, where they dwelt as contemporaries of the Sabines. They were a confederation of tribes, organized more perfectly than the Sabines, from whom they appear to have descended. Later they came in contact with the Romans in the northern part of Campania and were finally defeated in 272 B.C. Ultimately they were absorbed by the Romans, whose language and customs they adopted.

Samoan Islands (*sȧ-mō′ạn*), formerly NAVIGATORS' ISLANDS, an island group in the Pacific Ocean, east of the northern part of Australia and 4,200 m. s.w. of San Francisco, Cal. It consists of 12 islands, of which Tutuila, belonging to the U.S., is the most important. Located on Tutuila is Pago Pago, the only good harbor in Samoa and a U.S. naval station. The area of the group is about 1,700 sq. m. American Samoa is 76 sq. m. in area, and includes the islands of Tutuila, Ta'u, Ofu, Olosega, Swain's Island, and minor islets (population, *ca.* 13,000). In 1872, Pago Pago was leased to the U.S. as a coaling station and six years later, extra-territorial jurisdiction and freedom of trade rights were granted. The U.S., Great Britain, and Germany agreed, in 1889, to maintain the Samoan Islands as neutral territory, with an independent native government and a court of justice under an American judge; 10 years later, however, after native disorders were put down, the U.S. was assigned suzerainty over all the Samoan Islands east of 171° west longitude, Germany acquiring the islands west of that meridian. The British occupied German Samoa in 1914 and, following World War I, the former German islands became a New Zealand mandate and were named the Territory of Western Samoa. (Population, *ca.* 61,000.)



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The Samoan Islands are of volcanic origin, but in some regions are characterized by coral additions and reefs. Their surface is diversified by hills and mountains, but in the main it is remarkably fertile, with an abundance of wood and luxuriant vegetation. No native fauna prevails in the islands and the only indigenous animal is a species of bat. The principal products are copra, breadfruit, yams, coconuts, pineapples, oranges, and bananas. Copra and reed mats constitute the principal exports. The islands are of importance because of their location on the direct route between the Panama Canal and the East Indies.

The natives of the Samoan Islands are of the Polynesian race and were long governed by a native king. Their principal occupations are fishing and fruit growing. Tutuila has an area of 54 sq. m. Savaii is the largest island of the group, having an area of 658 sq. m. Upolu has an area of 340 sq. m. The latter contains the town of Apia, with a population of 1,950, the capital of the British possessions. Both American Samoa and Western Samoa were used as Allied bases during World War II.

Samos (*sā′mŏs*), an island off the coast of Asia Minor, in the Aegean Sea, 45 m. s.w. of Smyrna. It has an area of 180 sq. m. and forms a department of Greece. The surface is diversified by a range of mountains, of which Mt. Kerkis is the culminating peak, 4,730 ft. high. It has an abundance of timber, a fine climate, fertile soil, and adequate rainfall. The principal products include corn, olive oil, raisins, wine, skins, and fruits. It has valuable deposits of iron, lead, marble, and other minerals. Among the manufactures of the island are leather, liquids, utensils, clothing, carpets, pottery, and textile fabrics.

Samos was one of the most famous ancient Greek islands and was an influential member of the Ionic confederation. It possessed a powerful navy and under Polycrates, in 532 B.C., it was the predominating influence of the archipelago. It became a Roman province in 84 B.C., when its capital was made a free city. Samos was conquered by the Turks in 1550 and did not rebel against Turkish rule until in 1821. Though the Greek War of Independence established the independence of Greece, Samos remained a Turkish possession, for many decades administered by a Greek prince, tributary to the Sublime Porte. Limen Vatheos is the chief town. Population, *ca.* 75,000.

Samothrace (*săm'ō-thrās*), or THRACIAN SAMOS, an island in the northern part of the Aegean Sea, belonging to Greece. It is the most elevated island of the Greek Archipelago. The area is 65 sq. m. The highest peak, Mt. Saoce, is 5,245 ft. above sea level. This mountain may be seen from the Plains of Troy. From its summit Poseidon is said to have watched the decisive contest in the Trojan War. It has no harbor of importance, but has a considerable area of fertile soil, and is celebrated in history as the scene of sacred worship to the Cabeiri. The inhabitants aided Xerxes in the Battle of Salamis. The principal town is Chosa. Population, *ca.* 2,400.

Sampan (*săm'păn*), flat-bottomed river boat of China and other Far Eastern countries. Sampans are equipped, as a rule, with awnings and sails of matting. They are propelled by sculls worked at the stern.

Samphire (*săm'fīr*), a genus of perennial plants which grow on rocks near the sea especially along the Mediterranean coast of Europe. Common samphire and golden samphire are used in salads and pickles for their aroma. In the U.S., some species of *Salicornia* are called samphire.

Sampson (*sămp'sŭn*), WILLIAM T., naval officer, born in Palmyra, N.Y., Feb. 9, 1840; died May 6, 1902. He was graduated from the U.S. Naval Acad. at Annapolis in 1861, entered the navy the same year as master, and the following year became lieutenant. In the Civil War he served on the practice ship *John Adams* and the monitor *Patapsco*. He was on the latter when it was destroyed at Charleston in 1865. During the next two years he served in the European squadron, became commander in 1874, and was made captain in 1889. He had charge of the Naval Acad. from 1886 to 1890, when he became commander of the *San Francisco*. From 1892 until 1897 he was chief of the bureau of ordnance, and at the beginning of the Spanish-American War succeeded to the command of the North Atlantic squadron. President McKinley appointed him commodore on July 3, 1898, and, after the Battle of Santiago, made him rear admiral. On Aug. 16, 1898, he was made one of the commissioners to arrange for the Spanish evacuation of Cuba. The closing years of his life were clouded by a controversy between his friends and those of Adm. Schley over which admiral should be credited with the victory. See also *Schley, W.S.*

Samson (*săm'sŭn*), one of the judges of Israel, son of Manoah, who flourished about 1116-1096 B.C. He was of the tribe of Dan, a native of Zorah, and is noted as a hero of the Israelites and an avowed enemy of the Philistines. He became a Nazarite at birth and his head remained unshorn and his lips never tasted wine. It is recorded that he was endowed with peculiar physical strength, which enabled him to tear a lion to pieces with his hands. His great strength enabled him to slay 1,000 Philistines and to carry away the gates of Gaza. He became enamored of Delilah of Sorek, to whom he imparted the secret that his physical strength was due to his hair, which had never been shorn. She betrayed him into the hands of the Philistines by cutting off his hair. When it grew again his strength returned, and on the occasion of the festival of Dagon, Samson avenged himself against the Philistines, who had blinded him during his imprisonment, by pulling down the pillars of the building in which they had assembled. He perished with them. Milton's "Samson Agonistes" is a drama that makes use of the story of Samson's death.

Samuel (*săm'û-ęl*), a Jewish prophet who lived about 1100 B.C. He became the last judge of the Hebrews and unified the tribes in his fight against external enemies. Since the Jews elected kings essentially as war leaders, Saul became their king (*ca.* 1025 B.C.), much against the will of Samuel, who tried to paralyze Saul's power by founding schools of prophets (see *Prophets*). He became the leading antagonist of Saul, a fact which culminated in his sponsorship of David (*q.v.*).

1 and 2 Samuel are two books of the Old Testament, originally one. They begin with the birth of Samuel, but they tell essentially the story of Saul and David. Since they contradict themselves in some details and the same event is often described twice or three times, it is certain that they are derived from two different sources. Since at least one version was written during the time of Solomon (*ca.* 970-930 B.C.), it belongs to the earliest Jewish original sources.

Samurai (*săm'ŏŏ-rī*), a member of the military class of Japan during the country's feudal period. The term originally denoted the soldiers who guarded the Mikado's palace but was later applied to the entire military caste.

San Angelo (*săn ăn'ję-lô*), county seat of Tom Green County, Texas, 298 m. N.W. of Austin, on the Concho River, and on the Gulf, Colorado & Santa Fe and the Panhandle & Santa Fe R.R.'s. Cattle, sheep, goats, pecans, and cotton are the chief products. Manufactures include foundry, leather, and mohair products. One of the city's features is old Ft. Concho, a border military post. San Angelo was laid out in 1869 and incorporated in 1889. Population, 1960, 58,815.

San Antonio (*săn ăn-tō'nĭ-ō*), county seat of Bexar County, Texas, a tourist center and winter resort, on the San Antonio River, covering an area of 154.08 sq. m. The river winds through the city, flowing 15 m. to cover only six blocks. The city's parks, fiestas, landmarks, and cultural advantages, modern hotels, and warm dry winter climate draw many visitors. San Antonio is a historic city that houses many monuments of Spanish-American and Texan tradition, including the Alamo (*q.v.*), the Spanish Governor's Palace (1749) on Military Plaza, San Fernando Cathedral (1731) on Main Plaza, and five missions which were established at intervals of *ca.* 2 m. along the river, on alternate sides. Each mission was built as a unit to serve certain Indian tribes. The missions are San Antonio de Valero (1718), now the Alamo; San José y San Miguel de Aguayo (1720), a National Shrine; Nuestra Señora de la Purísima Concepcíon (1731); San Juan Capistrano (1731); and San Francisco de la Espada (1731). La Villita (little town) is a restoration of the once Indian, then Spanish, and later Anglo-American village; besides other attractions, it is the site of the Arneson River Theatre. Military installations include Ft. Sam Houston and Brooks Medical Center (both Army), and Kelly, Brooks, Randolph, and Lackland Air Force bases.

The city is served by the Missouri Pacific, Southern Pacific, and Missouri-Kansas-Texas R.R.'s. San Antonio International Airport is about 10 m. from downtown. The city is the center of a rich ranching region which also produces wool, cotton, citrus fruits, and nuts. Clay and lime deposits are found nearby. The city's manufactures include textiles, ceramics, cement, and clothing. San Antonio is the center of a standard metropolitan statistical area (pop., 1960, 687,151) including all of Bexar County. The city had a value added by manufacture of $144,573,000 in 1958.

The public-school system enrolls about 66,000 pupils annually. Educational institutions include St. Mary's Univ., Trinity Univ., Incarnate Word Coll., Our Lady of the Lake Coll., San Antonio Coll., Texas Military Inst., and Ursuline Acad. San Antonio has a symphony orchestra, Witte Museum (an art gallery), and the Marion Koogler McNay Art Inst. Brackenridge Park (320 acres) has a notable zoo.

The city is governed by a nine-member city council (elected every two years); the chairman is known as the mayor. Actual management rests with a city manager, who is appointed.

Photo by Harvey Patteson, San Antonio, Texas

BUSINESS SECTION OF SAN ANTONIO

San Antonio was founded in 1691; Franciscan friars established their first mission in 1718. In 1731 a Canary Islands group joined the community. It came under Mexican rule in 1821, and Texas patriots took over authority in 1836. After the admission of Texas to the Union (1845), the city grew rapidly. It has a large Spanish-speaking population (about 40 per cent), concentrated on the West Side. San Antonio serves as a winter home for numerous migrant workers who spend summers in other parts of the U.S. The population has grown with the economic build-up of the region, from 53,321 in 1900 to 161,379 in 1920, 253,854 in 1940, and 408,442 in 1950. In 1960 the population was 587,718.

San Benito (*săn bę-nē'tō*), a city in Cameron County, Texas, in the Lower Rio Grande Valley, 28 m. w. of the Gulf of Mexico. It is served by the Missouri Pacific R.R. The area is well irrigated, producing citrus fruits, cotton, livestock, and dairy products. It is a resort, with bathing and fishing at nearby Padre Island and other recreation centers. Laguna Atascosa National Wildlife Refuge is in the vicinity. It was settled in 1904 and named Bessie, but the name was changed to Diaz in 1907 and in the same year to San Benito. Population, 1950, 13,271; in 1960, 16,422.

San Bernardino (*bûr-när-dē'nō*), county seat of San Bernardino County, California, 58 m. E. of Los Angeles. It is on the Southern Pacific and other railroads. The surrounding region is farming, fruit-growing, and mining country. Among the city's industries are machine shops, foundries, grain elevators, and railroad shops. Nearby are the mountain resorts of Crestline, Lake Arrowhead, Hot Springs, and Big Bear Lakes. Old San Bernardino was founded by Padre Dumetz in 1810. A company of Mormons settled in the vicinity of San Bernardino in 1851. It was incorporated in 1854, but declined because of the departure of the Mormons, and it was rechartered as a city in 1863. Population, 1950, 63,058; of township, 88,961.

Sanborn (*săn'bûrn*), FRANKLIN BENJAMIN, author, born at Hampton Falls, N.H., Dec. 15, 1831; died Feb. 24, 1917. He was graduated from Harvard, became interested in the cause of antislavery, and in 1856 was chosen secretary of the Massachusetts-Kansas committee. From 1863 to 1868 he was secretary of the Massachusetts State Board of Charity, of which he was chairman from 1874 to 1878, and was actively interested in reforming the Tewksbury Almshouse. He was a founder of the Massachusetts infant asylum, established the Concord Summer School of Philosophy, and for some years was editorial writer for the Springfield *Republican*. His published works include "Life of Thoreau" and "Life and Letters of John Brown." He edited the poems of the younger W.E. Channing, Bronson Alcott's "Sonnets and Canzonettes," and William E. Channing's "Wanderer."

Sancho Panza (*săn'chō păn'zȧ*), a character immortalized by Cervantes (*q.v.*) in his novel "Don Quixote." Originally a simple peasant, he is persuaded by the promise of being made governor of an island to become the squire of Don Quixote. In this role, the practical Sancho Panza accompanies his master, Don Quixote, on the latter's numerous adventures.

Sand (*sănd*), particles of granular stone that are coarser than dust and finer than gravel. It results from the gradual disintegration of rocks under the action of water, but also from other causes, such as the detachment of particles from boulders and pebbles under the movement of particles due to frost, wind, or water. The color of sand corresponds to that of the minerals in the rock from which it is derived. In many places vast deposits of sand form under the action of water, as along the sea coast in consequence of wave action and in streams from the effect of running water. Extensive strata of sand were formed in different geological periods, occurring at various depths and ranging in thickness from a few inches to many hundreds of feet. In many places are deposits which originate from the action of wind, as in desert regions, where the dry sand is carried and deposited in drifts or sheets. Frequently such drifts are carried into the sea, as on the western coast of North Africa. In some regions, as in Poland, the sand deposits were formed largely by the action of glaciers, while on the coasts of many islands and continents vast dunes were formed. Similar sand deposits are still forming under the action of sea waves and currents. Sea sand often contains minute fragments of shells, particles of sponges, and other remains of animal matters. Siliceous sands serve many important purposes, including the manufacture of glass and the preparation of mortar. They are used in making molds for casting, preparing filters, and improving dense clay soils for cultivation. Deposits of valuable minerals, such as gold, copper, tin, diamond, iron, etc., occur in many places.

Sand, pen name of Amandine Lucie Aurore Dupin, Baronne Dudevant. See *Sand, George*.

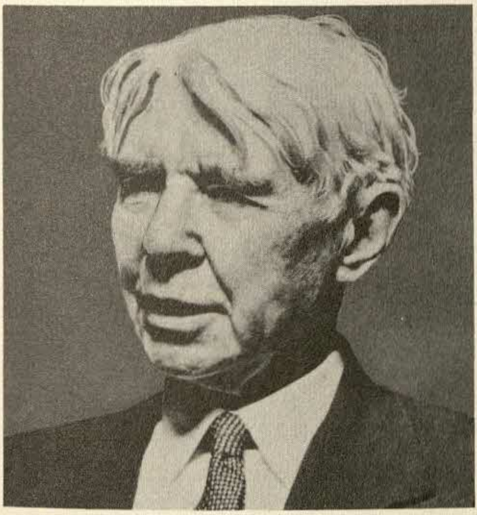
Sandalwood (*săn'dạl-wŏŏd*), the wood of any one of several trees of the sandalwood family. The tree, used for its aromatic wood, is native to India but has been introduced to the East Indies and other islands of the tropical regions of the Pacific. Sandalwood trees are greatly branched evergreen trees, with opposite leaves and compact and fine-grained wood, from which perfume is derived, but the wood is used more largely for the manufacture of ornamental products, such as desks, glove boxes, and other light articles. Red sandalwood, a genus in the legume family, produces a red dye. Most species do not grow to more than a foot in diameter. The Indian sandalwood trees attain a height of 30 ft. and mature in 20 to 30 years. A thick, viscid oil derived from the seeds is sometimes still used in India for illuminating purposes. Only the heartwood is employed for producing sandalwood oil, from which perfume and incense are made.

Several species of trees native to the Hawaiian Islands yield a sandalwood which is remarkable for its fragrance and the presence of valuable oil.

Sandblasting (*sănd'blăst-ĭng*), a process used in cleaning, carving, and engraving on metal, wood, and glass surfaces, through the medium of sand or an abrasive under high pressure. The abrasive is mixed with air and applied through a rubber hose, to exert a cutting effect on various materials. An abrasive-resistant tape may be used on the material to protect it against undesirable effects of the sandblasting. The process is used consistently in decorating glass, and a similar process, although on a much larger scale, is used for cleaning the exterior surfaces of boats and buildings.

Sandbur (*sănd'bûr*), a weed grass common to sandy regions of the temperate zones. A small plant, similar to the shorter native grasses, it is colloquially called burgrass. Many small spiny burs develop on the fruit and mature early in autumn. They are injurious to livestock, especially sheep, as they become attached to the hair and wool.

Sandburg (*sănd'bûrg*), CARL, poet, balladist, and biographer, born in Galesburg, Ill., Jan. 6, 1878. In 1914 he won a prize offered by *Poetry* magazine and in 1915 published his first volume of poetry, "Chicago Poems." That work and his subsequent books (including "Cornhuskers," 1918; "Smoke and Steel," 1920; "Slabs of the Sunburnt West," 1922; "Good Morning, America," 1928; and "The People, Yes," 1936) won him recognition as one of the great poets of America. He also wrote American fairy tales, "Rootabaga Stories" (1922) and "Rootabaga Pigeons" (1923), and in 1927 published a collection of American folksongs entitled "The American Songbag." His distinguished biography of Abraham Lincoln ("The Prairie Years," 1926; "The War Years," 1939) won a Pulitzer Prize in 1940, and in 1951 he was awarded another for his "Complete Poems." He published his first novel, "Remembrance Rock," in 1948; and an autobiographical book, "Always the Young Strangers," appeared in 1953, a young-people's version of which appeared (1955) under the title "Prairie-Town Boy." "The Sandburg Range" (1957) is a selection of his poetry and prose work. He has long been famous as a lecturer, as a ballad singer, and as a reader, both on the stage and on records, of his own works. Sandburg has often been compared to Walt Whitman, whose influence on Sandburg is undeniable. Both poets celebrate the common man, his fundamental wisdom and dignity; both find and describe beauty in objects commonly considered prosaic and ordinary; both write vigorous and effective free verse filled with subtle imagery.



CARL SANDBURG

Sandeau (*sän̲-dō′*), (LÉONARD SYLVAIN) JULES, novelist and dramatist, born in Aubusson, France, Feb. 19, 1811; died in Paris, April 24, 1883. He collaborated with George Sand (*q.v.*), who was his intimate friend, on articles for *Le Figaro* and on the novel *"Rose et Blanche"* (1831). He wrote plays with Émile Augier, including *"Mademoiselle de la Seiglière"* (1848) and *"Le Gendre de Monsieur Poirier"* (1854). In 1853 he was appointed librarian of the Mazarin Library and in 1859 the curator of this librarv.

Sand Eel (*sănl ēl*) or SAND LAUNCE, a small fish common along the colder coasts both north and south of the equator. There are about ten species, 6 in. to 12 in. long, with slender bodies, large forked tail fin, silvery skin, and no scales. They live in shoals in shallow water and when alarmed will rapidly bury themselves in the sand. They are used both for bait and for food.

Sanderling (*săn′dẽr-lĭng*), a small shore bird, about 8 in. in size. The sanderling breeds on the tundras of North America and Eurasia and is migratory, wintering from Virginia south to Argentina, South Africa, the islands in the South Pacific, and Australia. Its plumage is pale gray above and white below in the winter but becomes reddish above and on the breast during the breeding season. It is very active and frequents sandy beaches just out of reach of the advancing or receding waves, probing vigorously in the wet sand for small crustaceans and mollusks. The nest is a small hollow on the tundra among rocks or in a short clump of vegetation. During migration, it associates with other small shore birds and travels in small flocks, which always seem to be in a great hurry.

Sanders (*săn′dẽrz*), NICHOLAS, Roman Catholic polemicist and historian, born in Charlewood, England, *ca.* 1530; died in Ireland in 1581. Educated in England, he went to Rome after Elizabeth, a Protestant, ascended the throne, and was ordained there. Later, he investigated heresy in Poland, Lithuania, and Prussia, and subsequently expected to be made a cardinal. But while he was on his way to Rome in 1572, Pope Pius V died. Sanders then went to Madrid, where he tried to maneuver Philip II into open war with Elizabeth and force the restoration of Catholicism in England. In 1579 he joined forces with the Spanish and Italians who assisted the Irish rebellion, but the forces were defeated, and Sanders, after wandering around Ireland, died from exposure and hunger. Sanders was an extremist, who thought that evil could be eradicated by means of excommunication and by holy wars, ideas largely supported by the Church of his day. His reputation rests chiefly on the history he wrote about Catholics in England during the time of the Reformation, *"De Origine ac Progressu schismatis Anglicani"* (continued after 1558 by Edward Rishton and published in 1585).

Sand Fly (*sănd′ flī*), one of the names applied to several species of tiny biting flies or midges. The larvae are aquatic, living in fresh, brackish, or salt water, particularly tidal pools.

The adults, so small that they can pass through door and window screens, usually fly at night. If numerous, they can be most annoying. Other names are "punkies," "biting midges," and "no-see-ums."

Sand, GEORGE (pen name of AMANDINE LUCIE AURORE DUPIN, BARONNE DUDEVANT), novelist, born in Paris, France, July 5, 1804; died in Nohant, June 7, 1876. She was the daughter of Lt. Maurice Dupin, who died when she was four. She adapted her pen name from Jules Sandeau (*q.v.*), who collaborated on her first literary work, a romance entitled *"Rose et Blanche."* She began writing in 1831, after separating from her husband, Baron Casimir Dudevant, whom she had married in 1822. An ardent feminist, she flouted the conventions of society and was the friend of a number of men, including Frédéric Chopin. A woman of tremendous vitality and great intellect, she was the confidante of famous literary and musical figures, including Gustave Flaubert, Alfred de Musset, and Honoré de Balzac. The principal common denominator of her works was an interest in social reconstruction and in the idyllic rural scene. Among her better-known novels are "Indiana" (1832), "Lélia" (1839), "Consuelo" (1842), "La Comtesse de Rudolstadt" (1843), "Jeanne" (1844), and "François le Champi" (1849). She also published *"L'Histoire de ma vie"* (1847, *et seq.*). Her collected works comprise 109 volumes. The French writer André Maurois (*q.v.*) published (1953) a biography of her, "Lélia, The Life of George Sand," which was a worldwide best seller.

Courtesy Gramstorff Bros., Malden, Mass.

GEORGE SAND

Sandhopper (*sănd'hŏp-ẽr*), one of the names applied to several small crustaceans in the genus *Orchestia.* They live under mosses and decaying seaweed along beaches all around the world. They are very agile creatures, and although only ½ in. to ¾ in. long can leap to a height of several inches, dig themselves into the sand, or dive into the water to escape the birds and crabs that prey on them. The color of wet sand, sandhoppers are very hard to see unless they are in motion. They are also called beach fleas.

Sandhurst (*sănd'hûrst*), a parish in Berkshire, England, *ca.* 33 m. s.w. of London. It is the site of the Royal Military Coll., which was amalgamated in 1940 with the military college at Woolwich. Population, 1951, 5,244.

San Diego (*săn dĭ-ā'gô*), a seaport and the third-largest city in California, seat of San Diego County, *ca.* 140 m. s. of Los Angeles. It is the western terminus of the Atchison, Topeka & Santa Fe R.R. The municipal airport, Lindbergh Field, is 2 m. N.W. of the business district. San Diego is headquarters of the 11th Naval District and an important U.S. Navy base.

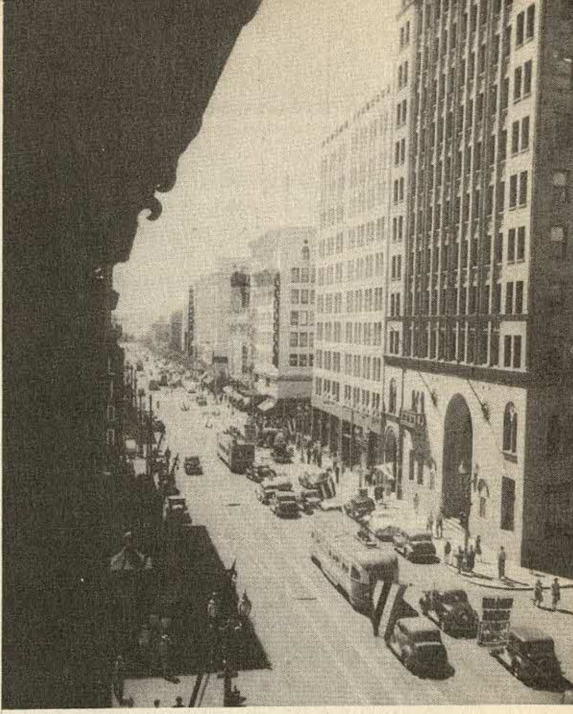
The city covers an area of 193 sq. m., at an altitude rising from sea level to 1,590 ft. Laid out along one of the world's finest natural harbors, San Diego also has 19 m. of Pacific coast beaches which are centers of recreational activity. The park system comprises 22 parks, of which the largest, Balboa Park, covers 1,400 acres in the heart of the city; it is the site of the San Diego Zoo, with exhibits of 3,700 wild animals. Nearby are Cabrillo National Monument, at the tip of Point Loma, and Torrey Pines Park, the only mainland site of the rare Torrey pine tree. The part of the city called Old San Diego was for 60 years headquarters of the Spanish garrison.

COMMERCE AND INDUSTRY: San Diego's importance as an industrial center is heightened by its excellent shipping facilities, including a new Marine Terminal, opened in 1958, which has drawn many shippers to the port. Among the city's major industries are the production of aircraft and missiles, tuna fishing and processing, shipbuilding and repair, food processing, and electronics. Among its manufactures are apparel, lumber and wood products, furniture, paper, chemicals, primary and fabricated metals, electrical and other machinery, and stone and glass products. The surrounding region is highly fertile; its 12-month growing season permits the raising of a wide diversity of crops. The tourist trade also is important in the city and its vicinity. San Diego is the center of a standard metropolitan area including all of San Diego County (4,258 sq. m.; pop. [est], 1958, 943,250), which in 1954 had a value added by manufacture of $390,218,000 and in 1958 an estimated $1,214,720,000. The 1954 figure for the city alone was $340,562,000; the 1958 estimate, $720,999,930.

EDUCATION AND CULTURAL INSTITUTIONS: The city's *ca.* 130 public and parochial elementary and secondary schools have an annual enrollment of *ca.* 122,000. Institutions of higher learning include San Diego State Coll., San Diego Junior Coll., California-Western Univ., San Diego Coll. for Men, San Diego Coll. for Women, and the Coll. of Law. Among cultural facilities are the Fine Arts Gallery, the Natural History Museum, and the Museum of Man, all located in Balboa Park. The public library system comprises about 15 branches and several bookmobiles.

GOVERNMENT: San Diego has a council-manager form of government, with a mayor and six councilmen elected for four-year terms.

HISTORY: Juan Rodríguez Cabrillo was the first white man to sail into San Diego Bay, in 1542. In 1602 Don Sebastián Viscaíno named the place after San Diego de Alcalá. The first California mission, San Diego de Alcalá, was built here in 1769 by Father Junípero Serra. San Diego was organized as a pueblo in 1835, becoming the first municipality in California. In 1848, by the treaty of Guadalupe Hidalgo, California became American territory, and in 1850



Courtesy San Diego Chamber of Commerce

SAN DIEGO. LOOKING DOWN BROADWAY

Courtesy San Diego City & County Visitors' Bureau

BALBOA PARK, SAN DIEGO

California Tower is a familiar landmark in the 1400-acre park, the largest in San Diego's extensive recreational park system

San Diego was chartered as a city. Alonzo E. Horton (1803-1909), called "Father Horton," came to San Diego in 1867, and largely through his efforts the city's growth began. The great boom of 1877 was followed by a collapse, but by 1885 when the Santa Fe R.R. made the city the terminus of a transcontinental line, its growth was assured. The U.S. Navy began its installations in 1907 with a coaling station, and from that time it has been an important factor in the city's population growth and one of its major employers. The aircraft industry came early to San Diego; the historic plane, "Spirit of St. Louis," in which Charles A. Lindbergh made the first solo flight across the Atlantic, was designed and built here.

POPULATION: In 1850 San Diego had a population of 650; by 1900, it was 17,700. During World War II began the great influx of newcomers; the decade from 1940 to 1950 saw an increase of 64.4 per cent—from 203,341 to 334,387. In 1960 the population was 573,224.

Sandino (*sän-dē′nō*), AUGUSTO CÉSAR, revolutionary, born in Niquinohomo, Nicaragua, in 1893; assassinated in Managua, Feb. 21, 1934. He was a member of a well-to-do family and later became a mining engineer. In the 1926-27 uprising in Nicaragua, Sandino joined the liberal forces against the conservatives. After U.S. intervention, he assembled a band with whom he carried out guerrilla warfare against the U.S. Marines were sent to the country to maintain order. In 1933, when the Marines were withdrawn, Sandino made peace with Pres. Juan Bautista Sacasa, who had been elected president, under U.S. supervision, in 1932. He and some of his followers then started a co-operative farm plan, but clashes soon broke out between his group and government forces. Sandino visited Pres. Sacasa to talk about ending these hostilities but, after dinner with the president, he was assassinated on the way to the airport. It never became clear who was responsible for the murder.

Sandomierz (*sän-dô′myĕsh*), a town in Poland, located on the Vistula River, *ca.* 50 m. S.E. of Kielce. The town, dating from at least the 11th century, is today only of historic and architectural interest. A Romanesque church of the 13th century and a Gothic cathedral of the 14th century are its chief points of interest. In 1570 a synod, uniting all Polish Protestants, was held here. The town was involved in many wars and political exchanges. In the 17th century, it was destroyed by the Swedes. In 1795 it was returned to Poland. Occupied by the Germans during World War II, Sandomierz was taken by Russian troops in August 1944. Population, *ca.* 8,000.

San Domingo (*săn dô-mĭng′gō*). See *Dominican Republic.*

Sandpaper (*sănd′pāp-ẽr*), the commercial name of a stout paper covered with sharp sand or ground glass, which is embedded in glue. It is used for smoothing or polishing ivory, wood, bone, and other materials. The paper employed in making this product is usually of a stiff brown kind, which is covered with glue, after which the sand is sifted upon the glue before it is fully dry. Sandpaper is made of various sizes and different grades. The coarser material is used for less delicate work, while the finer is made of very small grains of sand and used for polishing or smoothing surfaces of a delicate kind. Emery paper differs from sandpaper in that emery (*q.v.*) is used as the polishing agent instead of sand.

Sandpiper (*sănd′pīp-ẽr*), a member of a large group of small shore birds which numbers about 150 species. Most sandpipers frequent the shores of the oceans and seas, but a few breed very far inland on the banks of many small streams and ponds. They are found throughout the world, and many species are migratory, breeding very far north—to the shores of the Arctic Ocean—and returning to pass the winter in South America, South Africa, Australia, and New Zealand. All sandpipers resemble one another rather closely in appearance and can be characterized as having a plump body, a short tail, long legs, and a long slender bill. Their wings are long and pointed and, as might be expected from their long migrations, they are excellent fliers. The birds are alert and graceful. Among the better-known American species are the least, spotted, and purple sandpipers and the sanderling (*q.v.*). The *least sandpiper* is barely 6 in. in size and the smallest of the American sandpipers; it breeds in the bogs and marshes of the northern coniferous forests. The *spotted sandpiper* is found inland throughout the continent wherever there is a small body of water, and it has the curious habit of continuously dipping its tail up and down. The *purple sandpiper* is found only along the seashore on rocks covered by seaweed.

Sandringham Hall (*săn′drĭng-ạm hôl*), an English royal estate, located near Wolferton, England. The land (several thousand acres) was acquired in 1863 by the prince of Wales, who was later Edward VII. Points of interest are fine gardens and memorabilia of Edward VII. George V was born on the grounds and died in the main building.

Sandstone (*sănd′stōn*), a class of rocks composed of small, angular, or rounded grains of sand, usually quartz, cemented together. The common cementing materials are silica, iron oxides, calcium carbonate, and clay. Many kinds of sandstone occur in nature. Some are quite soft and porous, while others are very hard and durable. Conglomerate is a name given to rock consisting of pebbles of various sizes cemented together; if large and well rounded the rock is sometimes called puddingstone; if angular in shape it is called breccia. Quartzite is a variety in which the individual grains are cemented together with silica so firmly that the rock fractures as easily through the grains as through the cement.

Sandstones are named from their characteristic colors. They are often named, too, for the minerals to be found in them; for instance, a micaceous standstone is one in which mica flakes are prominent, and a calcareous sandstone is one containing considerable amounts of calcium carbonate. Sandstone of fine grain and uniform color is usually preferred for building purposes, while crushed sandstone can be used for road building and other concrete construction purposes. Flagstones are sandstones which readily split into thin slabs or sheets. Freestone is a sandstone that can be carved readily with equal ease in all directions. Ganister is a type of sandstone suitable for the manufacture of refractory silica brick. Deposits of sandstone of value in building occur in many sections of Canada and the U.S.

Sandusky (*săn-dŭs′kĭ*), a city in northern Ohio, seat of Erie County, on Sandusky Bay, near Lake Erie, 55 m. w. of Cleveland. An industrial city and important lake port, it is served by the New York Central, the Baltimore & Ohio (freight), and other railroads. Manufactures include machine bearings, electronic components, corrugated boxes, boats, chalk, and wines. The city had a value added by manufacture of $62,274,000 in 1958. Sandusky was first settled in 1816, and incorporated as a city in 1824. Population in 1950, 29,375; in 1960, 31,989.

Sandusky, a river rising in Richland County in north central Ohio, about 150 m. long. It flows west and then north and empties into Sandusky Bay at Sandusky, Ohio.

Sandwich (*sănd′wĭch*), EDWARD MONTAGU, FIRST EARL OF SANDWICH, naval commander, born July 27, 1625; killed in action, May 28, 1672. He fought with the Parliamentary army during the Civil War and, although a close friend of Cromwell's, took little part in politics until he was appointed to the council of state in 1653. He assisted in the restoration of Charles II and was created an earl and appointed general of the fleet in 1660, with Samuel Pepys (*q.v.*) as his secretary. For a time (1666-69), he represented England in Madrid, but he returned to take part in the war against the Dutch and was killed in the battle of Southwold Bay, when his ship was blown up. He was buried in Westminster Abbey.

Sandwich Islands, the former name of *Hawaii* (*q.v.*).

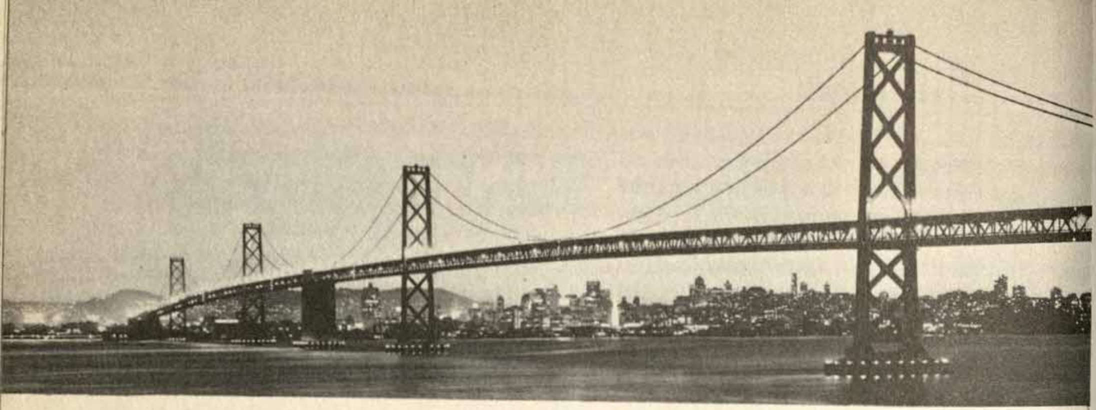
Sandy Hook (*sănd′ĭ hŏŏk*), a peninsula extending from Monmouth Country, New Jersey, to the entrance of New York harbor. It is a low and sandy point of land about 6 m. long. At its northern end is the Sandy Hook lighthouse, 90 ft. high. Immediately south of the lighthouse is Ft. Hancock, a Nike Hercules air defense installation. A park and recreational area occupy *ca.* 460 acres in the southern portion of the peninsula.

Sandys (*săndz*), SIR EDWIN, MONTAGU, colonist, born in Worcester, England, Dec. 9, 1561; died in Northborne, Kent, October 1629. The second son of Edwin Sandys (1516-88), archbishop of York, he was a member of Parliament for a number of terms and was knighted by James I. Although he was an official of the East India and Virginia companies, he fought the great monopolies and advanced the principle of constitutional limitations on power of both king and people. Suspected of plotting the establishment of a republican government in America, he was imprisoned in 1621. He was influential in securing the charter for the *Mayflower*.

Sandys, GEORGE, colonist, traveler, and brother of Sir Edwin Sandys (*q.v.*), born in York, England, 1578; died at Bexley Abbey, Kent, England, in March 1644. He was treasurer of the Virginia Co. and lived in Virginia from 1621 to 1628. He built the first watermill, the first ironworks, and the first ship in Virginia. He traveled extensively and contributed much to the knowledge of geography and ethnology. He translated Ovid's "Metamorphoses" and Book I of the "Aeneid" (*q.v.*). Sandys was the originator of the closed, antithetically balanced couplet later utilized by Dryden and Pope (*qq.v.*).

San Fernando (*săn fĕr-năn′dō*), a city in southwestern California, 21 m. N.W. of the center of Los Angeles. The city is served by the Southern Pacific Lines. Located in northern San Fernando Valley, it has industries centering around the growing and packing of citrus fruits and vegetables. The city had a value added by manufacture of $5,954,000 in 1958. Founded in 1874, the city was incorporated in 1911. Population, 1950, 12,992; in 1960, 16,093.

San Francisco (*săn frăn-sĭs′kō*), a maritime city and port of entry on the Pacific coast of the U.S., the second-largest city in California. It rises on a hilly peninsula between San Francisco Bay and the ocean, where a break occurs in the Coast Ranges at the San Francisco-San Mateo county border. It has one of the finest natural harbors in the world, entered through the Golden Gate (*q.v.*). It is a cultured and cosmopolitan city, and, in its area of 47.6 sq. m., it is a city of many cities because of the diversified population that fused the architecture and social relations of many nationalities within its bounds. The Ferry Building, 240 ft. high, at the foot of Market St., is the sym-



Courtesy Ewing Galloway

SAN FRANCISCO-OAKLAND BAY BRIDGE

bol of the city and is visible from a great distance.

San Francisco has more than 50 parks and many historical landmarks, which, along with four islands in San Francisco Bay, contribute to the scenic beauty of the city. The islands are Angel Island, which serves as an Army rocket station; Alcatraz Island; Treasure Island, built for the Golden Gate International Exposition (1939-40) and now the home of the U.S. Naval Schools Command and a naval station; and Yerba Buena Island, joined to Treasure Island by a solid causeway. Golden Gate Park, one of the finest man-made parks in the world, contains a planetarium, the California Acad. of Sciences, and the Japanese Tea Garden. The Presidio is a combination park and military headquarters for the Sixth U.S. Army. Within its area are Ft. Winfield Scott, a large military hospital, and the oldest building in San Francisco, built in 1776. Across from the Presidio is the Palace of Fine Arts, remains of the Panama Pacific International Exposition of 1915. Fisherman's Wharf is another attraction of note, with its colorful fishing fleet and restaurants along the waterfront, offering a view of the harbor and the skyline of the city. Along the ocean front are the zoological gardens. Adjoining the zoo is Fleishhacker Pool, the largest outdoor saltwater swimming pool in the world. In all, San Francisco devotes more than 4,000 acres of land to its system of recreational and park facilities.

San Francisco's street system is laid out in a checkerboard fashion, hill and valley alike, with the result that many of the streets ascend the slopes at an incline that necessitates stairways for the sidewalks and cable cars to climb the streets. Market St. is the chief business thoroughfare. North of Market St. from the Bay to Van Ness Ave. is the downtown business and financial district. The hotel, theater, and shopping district centers around Union Square, which has a four-story underground garage. Chinatown—largest Chinese community outside Asia, comprising 25,000 people—borders the shopping district and extends to the Italian quarters ending with Fisherman's Wharf on the Embarcadero. Nob Hill, Telegraph Hill, and Russian Hill are the apartment districts. South of Market St. to the city line are the principal industrial areas. The residential districts include the Western Addition, Sunset District, Richmond District, St. Francis Woods, Park Merced, and Seacliff.

Buildings. The city, state, and Federal governments are grouped together in the Civic Center, comprising the City Hall, Civic Auditorium, War Memorial Opera House, War Memorial Building, San Francisco Museum of Art, the State Building, the Public Library, and the Federal Building containing the headquarters of the 12th Naval District. Commercial buildings of interest are the Pacific Telephone and Telegraph Building, Russ Building, Pacific Gas and Electric Building, Matson and Hobart Buildings, Standard Oil and Shell Oil buildings, the U.S. Mint, and the U.S. Treasury Building. Outstanding churches are the Mission Dolores, founded in 1776 and one of California's 21 original missions; the Tin How Temple, the oldest Chinese place of worship in the city; Temple Emanu-El; Grace Cathedral (Protestant Episcopal), and Cathedral of St. Mary (Assumption; Roman Catholic). San Francisco has 575 hotels, including the St. Francis and the Fairmont. Fort Mason is located in the city.

Transportation: The city is served by six railroads, including the Southern Pacific, Western Pacific, Atchison, Topeka and Santa Fe, and Union Pacific R.R.'s. An international airport is located about 10 m. from the city. Because of its strategic location, San Francisco is a key port on the Pacific coast, functioning as a shipping center for goods flowing to and from Asia, Europe, and America. It houses the San Francisco Naval Shipyard. Its waterfront, the Embarcadero, extends for 17.5 m. and curves around three sides of the city.

Industry and Commerce: San Francisco, the financial capital of the West, is headquarters of the Bank of America and seat of Federal Reserve Bank, District 12. The major fields of activity are food processing, publishing, and manufacture of fabricated metals, machinery, chemicals, apparel, and furniture and fixtures. Other important indus-

Deane Dickason, from Ewing Galloway

COIT MEMORIAL TOWER, TELEGRAPH HILL

Photo by Philip Fein, San Francisco, Calif.

SAN FRANCISCO. HYDE STREET

tries are building construction and services. With the completion of the Golden Gate and the San Francisco-Oakland Bay bridges, the city became one with the surrounding communities. It is the center of a standard metropolitan statistical area (pop., 1960, 2,783,359) comprising Alameda, Contra Costa, Marin, San Francisco, San Mateo, and Solano counties. The city had a value added by manufacture in 1958 of $576,273,000.

EDUCATION: The public-school system enrolls about 85,000 pupils annually; another 6,000 pupils are educated at parochial schools. Within the city limits are four institutions of higher education, San Francisco State Coll., City Coll., San Francisco Coll. for Women, and the Univ. of San Francisco. The Univ. of California maintains several branches in San Francisco, including the colleges of medicine, dentistry, pharmacy, law, and the California School of Fine Arts. The medical college of Stanford Univ. is also located here. The California Acad. of Sciences maintains a group of scientific exhibits, including its nationally known Steinhart Aquarium. The museums and art galleries include the California Palace of the Legion of Honor, housing paintings, tapestries, and sculptures, and the M. H. de Young Memorial Museum, famed for its Oakes and Kress collections. The San Francisco Symphony Orchestra performs regularly between November and May.

GOVERNMENT: San Francisco city and county are a corporation which has consolidated city and county government, with legislative powers vested in an 11-member board of supervisors, elected for four-year terms. The administrative branch is presided over by the mayor (elected every four years) and the chief administrative officer, appointed by the mayor. Other elective officers serve four-year terms; appointed officials serve at the mayor's discretion.

HISTORY: Until Lt. Juan Manuel de Ayala, of Spain, sailed the *San Carlos* through the Golden Gate on Aug. 5, 1775, San Francisco remained an unknown but much sought after prize. In 1542 Juan Rodríguez Cabrillo, a Portuguese explorer and companion of Cortez, entered the gulf outside the Golden Gate and discovered the Farallone Islands while seeking a haven for Spanish treasure galleons. Although Francis Drake passed by the Bay and landed at the present site of Marin County, the first person to see the Bay was Sgt. José Ortega, an advance scout for the Gaspar de Portolá expedition, which was searching for the Bay of Monterey and, through misinformation, chanced upon San Francisco Bay on Nov. 1-3, 1709. Between 1776 and 1847 San Francisco was under Spanish and Mexican rule. On July 9, 1846, Capt. John B. Montgomery, with 70 sailors and marines from the U.S.S. *Portsmouth,* ran up an American flag on Mexico's flagpole, thereby establishing the first American government in San Francisco—called Yerba Buena under the Spanish. With the discovery of gold in 1848 on the American River, California became a magnet indiscriminately drawing men and women from all parts of the world. This influx commenced a period of lawlessness, anarchy, and graft. From 1850, when it was incorporated as a city, to 1900, San Francisco slowly pushed from around Telegraph Hill to the ocean. The pony express reached the city in 1860 and the railroad in 1869. On April 18, 1906, the city suffered heavily from an earthquake and resulting fire (see also *Accidents and Disasters*). The city was soon rebuilt to grow into a metropolis of unusual beauty. With the outbreak of World War II, San Francisco cleared more military cargo than any other port in the nation. On June 26, 1945, it was host to the U.N. Charter Conference. The population grew from 34,000 in 1850 to 298,997 in 1890 and 342,782 in 1900. Its decade of greatest growth was 1920-30—from 506,676 to 634,394. In 1950 the population was 775,357; in 1960, 740,316.

San Francisco Bay, a land-locked bay situated on the coast of California and separated from the Pacific Ocean by the Golden Gate Channel. It contains a number of islands, including Alcatraz (once a Federal prison), Angel, and Yerba Buena. It is 55 m. long and 12 m. wide.

Sanger (*săng′ẽr*), a person who digs and gathers ginseng; also the name of a Chinese herb used as medicine.

Sanger, MARGARET, leader of the planned parenthood movement, born MARGARET HIGGINS in Corning, N.Y., Sept. 14, 1883. As a trained nurse, she recognized the need for knowledge of safe birth-control methods and devoted herself to arousing interest in what was then a "forbidden" subject. In 1915, she was indicted for using the mails to disseminate literature on birth-control measures; but the case was dropped before being brought to trial. In the following year she was imprisoned for conducting a birth-control clinic in New York; however, in a subsequent trial the court held that a New York physician might advocate contraception in the "cure and prevention of disease."

She organized the first American Birth Control Congress in New York City in 1921; during the following years she traveled widely, establishing teaching centers, organizing bureaus and congresses, and launching the birth-control movement in the U.S., Europe, and the Far East. Chairman of the Family Planning Assn. (founded 1939) and president of the International Planned Parenthood Foundation (1948), Mrs. Sanger is recognized as being pre-eminent in the legalization and widespread use of scientific birth-control methods today. Among her books are: "What Every Boy and Girl Should Know" (1927), "Motherhood in Bondage" (1928), and "Margaret Sanger, an Autobiography" (1938). See also *Birth Control.*

Sangihe Islands (*säng′ĭr*), an island group (314 sq. m.) in Indonesia, situated between the Celebes and the Philippines. The group has many small islands; the largest, Sangihe, is 30 m. long, with an average width of 10 m. The islands contain a number of active volcanoes, of which Goenoeng Awoe (*ca.* 6,000 ft.) is the most important. Most of the islands are inhabited and have a fertile soil, producing coconut palms, fruits, hemp, rice, sago, and tobacco. Population, *ca.* 135,000.

Sangir Islands (*säng′ĭr*), former name of the Sangihe Islands (*q.v.*).

Sanhedrin (*săn′hē-drĭn*), a council and tribunal of the Jews. Some writers trace its origin to the 70 elders appointed by Moses, but this view is not supported by the early Greek writers. It is thought to date from the time of the Maccabees and was probably established under John Hyrcanus (2nd century B.C.). In the later period there were several sanhedrins, of which the Great Sanhedrin was the supreme authority. It was composed of 71 priests, scribes, and elders of the people and was presided over by the high priest. The tribunal originally had power over life and death, but this power it ultimately lost. Herod was summoned before the sanhedrin in 47 B.C. for putting people to death, and Jesus was denounced by it for claiming to be the Messiah. The council was disbanded A.D. 425, when Theodosius had the last president put to death. The lesser sanhedrins, or provincial courts, of which there was one in each large town, were composed of 23 members, who were appointed by the Great Sanhedrin in the city of Jerusalem.

Sanitary Science (*săn′ĭ-tâ-rȳ sī′ęns*). See *Hygiene; Sewerage.*

San Jacinto (*săn jȧ-sĭn′tō*), BATTLE OF, the closing battle of the war for independence of Texas, which took place near the town of San Jacinto, Texas, April 21, 1836. The Texan army of 783 men under Gen. Houston was attacked by 1,536 Mexicans under Santa Anna and, after a desperate struggle of an hour, in which the Mexicans lost about 600 men, the latter surrendered. The independence of Texas was favored by the U.S. government, and many of Houston's soldiers had been openly enlisted in New Orleans.

San Joaquin (*săn wä-ḳēn′*), a river in California, which rises in the Sierra Nevada Mts. and, after a general course of 350 m. toward the northwest, joins the Sacramento at its entrance into Suisun Bay. It receives the water from Tulare Lake by the Kings River. Another tributary, the Merced, drains the famous Yosemite Valley. The San Joaquin valley is a large part of the fertile region of Central California and produces vast quantities of cereals, grasses, and fruits.

San Jose (*săn hō-zā′*), a city in western California, seat of Santa Clara County, 40 m. S.E. of San Francisco. With an area of 54.5 sq. m., San Jose is situated between the Coyote and Guadelupe rivers, which flow into San Francisco Bay about 6 m. from the city. It is served by the Southern Pacific R.R. and Barret Airport. The city is in the heart of the Santa Clara Valley, the largest fruit-canning and packing center in the U.S. Mineral deposits include mercury, clay, and stone. The city's manufactures include foods, electrical products, machinery, and fabricated metals. In 1958 San Jose had a value added by manufacture of $223,045,000. It is the center of the San Jose standard metropolitan statistical area (1,302 sq. m.; 1960 pop., 642,315), which includes all of Santa Clara County. The value added of the area in 1958 was $671,982,000.

The city is noted for the Municipal Rose Gardens; Alum Rock Park; and the Egyptian-style buildings of the Rosicrucian Order, including a planetarium and oriental museum. It is the seat of San Jose State Coll. (1857), the oldest state college, and of San Jose City Coll. The nearby Univ. of Santa Clara, founded in 1777 as a mission school, was the first institution of higher learning in California. On neighboring Mt. Hamilton is Lick Observatory (*q.v.*) with its powerful 36-in. telescope.

San Jose was founded in 1777 as the Pueblo de San José de Guadelupe. Incorporated in 1850, it was the seat of the first California legislature. In

1900, San Jose had a population of 21,500; in 1940, 68,457. Its decade of greatest growth was 1950-60, which saw an increase from 95,280 to 204,196.

San José, the capital of Costa Rica, Central America, situated near the center of the country, on an elevated and fertile plain 3,775 ft. above sea level; also, a province in central Costa Rica, 1,729 sq. m. in area, pop., 1960, 411,308. The capital city is connected by railway with the Caribbean Sea and the Pacific Ocean. The principal buildings include a cathedral, a bishop's palace, the government buildings, and a university. The city has a public museum and a number of parks. Since 1823, when the capital was moved from Cartago, San José has been the capital. Population, *ca.* 225,000.

San Juan (*sän hwän′*), a river of Central America, important because of its location on the route of the proposed Nicaragua Canal. It is the outlet of Lake Nicaragua, flowing to the south and east for about two-thirds of its length, after which it makes a bold turn toward the northeast and enters the Caribbean Sea a short distance south of Greytown. The entire length is about 115 m., but only about one-half of its lower course would be serviceable in the canal. In 1529 Diego Machuca sailed down the river from Nicaragua Lake; this was the first time that it was navigated.

San Juan, the capital city of Puerto Rico, situated on a peninsula on the north side of the Gulf of San Juan. It has one of the finest harbors in the West Indies and is the seat of an extensive trade in native products and imports. Railroad connections afford adequate communication with the interior. The city is served by steamship and cable lines. Among the manufactures are sugar, liquors, tobacco products, clothing, soap, utensils, and machinery. The noteworthy structures include the city hall, the government building, the theater, the public library, the military hospital, the cathedral, and the Jesuit Coll. A statue of Ponce de León is located on the Plaza de Santiago. Morro Castle, built in 1584, is situated on a promontory in the western part of the city. The city was founded by Ponce de León in 1521. It was bombarded by the Dutch in 1625, and in 1898 it became a possession of the U.S. Population, 1950, 224,767; in 1960, 432,377.

San Juan Islands, an archipelago in the Gulf of Georgia, lying between the mainland and Vancouver Island. They constitute San Juan County, in the State of Washington. The principal islands are San Juan and Orcas. Friday Harbor is the chief town and county seat. They were a source of dispute between the U.S. and Canada for some time after concluding the treaty of 1846. The U.S. contended that the boundary extended through the middle of the Canal de Haro, which separates the islands from Vancouver Island, while Great Britain maintained that the boundary passed through Rosario Strait. In 1871 the controversy was referred to the Emperor of Germany, who rendered a decision in favor of the U.S.

Courtesy Natl. Tourist Bd. of Costa Rica

ENTRANCE TO SAN LUCAS ISLAND

Sankey (*săng′kĭ*), IRA DAVID, evangelist, born in Edinburg, Pa., Aug. 28, 1840; died Aug. 13, 1908. At an early age he displayed much fondness for music. In 1855 he became leader of the Methodist church choir in Newcastle, Pa. He met Dwight L. Moody (*q.v.*) in 1870 and joined in his evangelical work; his fine baritone voice made him a valuable auxiliary to this work. In later years Sankey became almost totally blind. He published "Sacred Songs and Solos," "Gospel Hymns," and "Winnowed Songs for Sunday Schools." His best-known songs include "Throw Out the Life Line," "Pull for the Shore," and "The Ninety and Nine."

San Leandro (*săn lē-ăn′drō*), a city in western California, in Alameda County, 15 m. S.E. of Oakland. It is served by the Southern Pacific and Western Pacific R.R.s and by Oakland Airport, 3 m. N.W. of the city. Its diversified industries include horticulture, dairying, canning, and the manufacture of machinery, paper products, and scientific instruments. The value added by manufacture, 1958, was $117,740,000. Nearby is Grass Valley Regional Park, 3,000 acres in area. San Leandro was settled in 1837 and was incorporated in 1872. Its population in 1960 was 65,962.

San Lucas Island (*sän lū′kạs ī′lạnd*), an island of the Republic of Costa Rica, in the province of Puntarenas. Situated off the west coast, in the Gulf of Nicoya, the island is indented by three bays. A penitentiary is located there. The island's history is obscure; it was once the seat of an ancient settlement of Caribs, of which little is known. Legends report that pirates buried treasure on the island, but numerous excavations have been made to no avail.

San Luis Obispo (*săn lōō′ĭs ō-bĭs′pō*), a city in southwestern California, seat of San Luis Obispo County, 218 m. N.W. of Los Angeles, on the Southern Pacific R.R. and others. The surrounding area produces livestock, cereals, and dairy products. The city was settled in 1772. Population, 1960, 20,437.

San Luis Potosí (*sän lwēs′ pō-tō-sē′*), a city in central Mexico, capital of a state of the same name, 360 m. N.W. of Mexico City. The site is on a fertile tableland 6,375 ft. above sea level. In the vicinity are gold and silver mines and large smelting works. Founded in 1586, the city owes its prosperity to the mines and railroad traffic. Population, *ca.* 174,000.

San Marino (*sän mạ-rē′nō*), an independent republic in Europe, situated on the eastern slope of the Apennines, about 40 m. S.E. of Ravenna, Italy. It is the smallest republic in the world and claims to be the oldest state in Europe. It is entirely encircled by provinces formerly belonging to the papal states, but which are now included in Italy. The area is 38 sq. m. It is a hilly district, the highest point, Mount Titano, being 2,650 ft. above the sea. The climate is healthful, but the country is somewhat windy and subject to frequent rains. Farming, fruit culture, and stock breeding are the principal occupations. San Marino is the capital. A museum, several government buildings, and five churches are among the noteworthy structures.

The government is by a grand council of 60 members. The executive authority is vested in two regents, who are chosen by the grand council. Each holds office for six months. Control of the council is in the hands of a coalition of Christian Democrats and Democratic Socialists, who form the majority; the Communists and left-wing Socialists constitute the opposition. San Marino was recognized as an independent republic by the pope in 1631 and has guarded its independence with remarkable zeal ever since. In 1862 it placed itself under the protection of Italy and, in 1915, declared war upon Austria-Hungary. When it was invaded by Germany in 1944, it immediately declared war on the Reich. Population, *ca.* 14,000.

San Martín (*sän mär-tēn′*), JOSÉ DE, soldier, born at Yapeyu, Argentina, Feb. 25, 1778; died Aug. 17, 1850. In 1811 he joined the Revolutionists and sailed for Buenos Aires, where he was made commander of a regiment of cavalry. He defeated the Spanish at San Lorenzo and in 1814 commanded the insurgent army of Peru. In 1818 he joined the movement for independence in Chile, where a republic was established, and in 1821 he took part in proclaiming the independence of Peru. The following year he resigned his command and sailed to Europe, leaving the task of conquering the country to Simón Bolívar (*q.v.*).

San Mateo (*săn mạ-tā′ō*), a city on the peninsula in western California, 17 m. S. of San Francisco. It is served by the Southern Pacific Lines. The growing of cut flowers and vegetables are major agricultural industries; the city's manufactures include electrical equipment, fabricated metals, chemicals, machinery, and transportation equipment. San Mateo was laid out in 1863 and incorporated in 1894. Population, 1960, 69,870.

Sanmicheli (*sän-mē-ḳā′lē*), MICHELE, architect and engineer, born in 1484 in Verona, Italy; died in 1559. He is said to have invented the pentagonal bastion for fortifications. He designed many notable churches, including the Chapel at San Domenico, the Petrucci, and the Grimani Palace at Venice. The Pompeii Palace in Verona is his masterpiece.

San Rafael (*săn rȧ-fĕl′*), city in California, seat of Marin County, 15 m. N. of San Francisco, on San Pablo Strait and on the Northwestern Pacific R.R. It has creameries, printing offices, and leather manufactures. San Rafael was incorporated in 1913. Population, 1960, 20,460.

San Remo (*sän rā′mō*), a resort city of northern Italy, on the Gulf of Genoa, 26 m. E.N.E. of Nice, on the Riviera. It trades in olive oil, palms, and lemons, and manufactures perfumes and mosaic tiles. It is popular with tourists in the winter season. Population, *ca.* 25,000.

San Salvador (*sän säl′vä-dôr*), a city in Central America, capital of the Republic of El Salvador, located 105 m. S.E. of Guatemala. It is situated in the center of a rich farming country and has a large island trade. The noteworthy buildings include the national palace, a university, a cathedral, and the national theater. Near the city is the extinct volcano of San Salvador, height 8,365 ft. It has a large trade in grain, sugar, tobacco, and indigo. The Spaniards founded the city in 1528. In April 1854, an earthquake completely destroyed the city. It was subsequently rebuilt. Population, 1960, 426,781.

Sans-Culotte (*sänz-ḳü-lŏt′*), a French term meaning "without breeches." At the outbreak of the Revolution in France it was disparagingly applied by the court party to the advocates of democratic principles, who had adopted the use of trousers instead of the knee breeches then in fashion. The advocates of democracy turned the term to good use, applying it to themselves as patriots. The term fell into disuse toward the close of the Convention.

San Sebastian (*sän sȧ-bäs-tyän′*), a seaport, resort, and the capital city of the Basque province of Guipúzcoa, Spain. It is 12 m. from the French border. There are lumber and flour mills, important fisheries, and manufactures of preserves, soap, glass, candles, and paper. The old town was enclosed by ramparts until 1863. Population, 1960, 135,149.

Sanskrit (*săn′sḳrĭt*), the oldest of the Indo-Iranian languages. Sanskrit is still cultivated as a classical language and is the sacred language of the Brahmans. It is highly valuable to philologists, since philology did not assume the importance of a science until Sanskrit became known to Europeans. The word Sanskrit is applied only to the symmetrically formed language preserved in the classical and sacred writings of the Hindus, the word meaning *carefully constructed*. In this sense it stands opposed to *Prakrit;* that is, natural or common, the Sanskrit dialect spoken by the unlearned people, such as women and servants, in the Sanskrit dramas. The Prakrit is a branch of the southern division of Aryan languages and is the source of the vernaculars of modern India. The Sanskrit never attained a wide use among the common people, but in its purity constituted the written and spoken form among the educated classes.

The Sanskrit alphabet has 14 vowels and diphthongs and 33 consonants, but to these are added several secondary characters. Among the peculiarities in Sanskrit grammar is its limited use of prepositions to govern nouns. They occur instead as prefixes of verbs. Three genders are recognized, the masculine, feminine, and common; and three numbers, the singular, dual, and plural. The eight cases include nominative, accusative, instrumental, dative, ablative, locative, genitive, and vocative. Writers recognize a peculiar resemblance between it and the Greek, in that both languages are highly inflected, and there is a similarity in the forms of the verbs. Two distinct periods are recognized in the history of Sanskrit. The first epoch represents the use of the language as contained in the Vedic hymns, and the other embraces its use in the epic writings, the laws, and other later literature.

LITERATURE. Sanskrit literature is made up of a large number of writings, the most important of which are of a religious character. It may be said that the literature begins with the *Vedas* and dates probably from 2000 to 1500 B.C. Four collections are included in the Vedic writings, which are looked upon as the source from which all sacred writings of the Hindus were drawn. These collections include the large work called *Rig-Veda,* the collection of verses known as *Sama-Veda,* the verses or sacrifices known as *Yujur-Veda,* and the edition known as *Atharva-Veda.* A later work or treatise relating to religious practice is called *Puranas*. The law literature is of next importance, including a treatise on religious and civil law known as *Dharma-Shastra,* which embraces additions relating to education, marriage, funeral rites, and the duties of teachers and officers. In the writings classed as epics are a number of interesting works, but the most important include the *Rámáyana* and the *Mahábhárata*. The latter is a work of 220,000 lines and is believed to be the production of writers who flourished in different periods. It contains epic and lyric poems, mythical history, and philosophical investigations. The *Rámáyana* embraces an account of Rama, a prince of Oude, whose heroic conquest of the Deccan and Ceylon is recounted.

The dramatic writings of the Hindus are inferior, when considered on a comparative basis with their works in other lines, which is partly due to the use of Prakrit when representing females and the lower characters, while the highest form of Sanskrit is employed in presenting the higher male characters. These writings are rich in fables, including the earlier collection known as *Panchatantra* and the later group of writings known as *Hitopadesha*. Many of these fables became current in the literature of all the Eastern peoples, and even reached a wide use among the people of Europe in the Middle Ages. Their works in history, music, anatomy, medicine, and architecture are also important. It is particularly noteworthy that their writings in astronomy and arithmetic are of a high character, and include a treatise on the solar year, which they divided into 365 days. Their astronomer, Aryabhatta, afirmed the revolution of the earth on its axis, gave the true theory of the causes of solar and lunar eclipses, and observed the motion of the equinoxes and solstices.

In lexicography the Aryans had a number of works that embrace commentaries on words and trace many of them from their roots. Precision of language was a peculiar characteristic of their writers, which is evidenced by numerous works on grammar and prosody. The oldest extant work on Sanskrit grammar dates from the 4th century B.C., and is assigned to a writer named Panini. Many literary productions and treatises in the Sanskrit emanated from Buddhist and Brahman writers of recent date, though these writers employed modern forms of the language. It is made certain by inscriptions that Sanskrit in its purity ceased to be a spoken tongue at least 200 years before the Christian era.

Sans Souci (*sän sōō-sē′*), French meaning "without worry" or "carefree," the name of a charming castle and park at Potsdam, near Berlin, Germany. Frederick II the Great, King of Prussia, ordered Sans Souci to be built (1745-47) by Georg Wenzel von Knobelsdorff. This castle, with its highly developed Rococo style, was the favorite resort of the king, who died there in 1786. See *Rococo Style*.

Santa Ana (*săn′tạ ăn′ạ*), a city in southern California, seat of Orange County, on the Santa Ana River and at the base of the Santa Ana Mts., 30 m. s. of Los Angeles. It is served by the Atchison, Topeka and Santa Fe, the Southern Pacific, and other R.R.'s. Long Beach International Airport is *ca.* 25 m. E. of the city. It is the seat of Santa Ana Junior Coll. Other educational institutions in the vicinity are Orange Coast Coll. and

Chapman Coll. Near the city is El Toro, a Marine Corps air station.

Located in a rich agricultural area which produces citrus and other fruits, dairy products, sugar beets, pimientos, nuts, and truck crops, Santa Ana is a food-processing center and a shipping point for farm products. With oilfields nearby, its other industries include oil refining, construction, electronics, and the manufacture of rubber products and machinery. In 1958 Santa Ana had a value added by manufacture of $43,103,000. It is part of the Los Angeles-Long Beach standard metropolitan statistical area (1960 pop., 6,742,696), which includes all of Los Angeles and Orange counties.

Santa Ana was founded in 1869 and incorporated in 1886. Its decade of greatest growth was between 1950, when the population was 45,533, and 1960, when it was 100,350.

Santa Ana (*sän′tä ä′nä*), a city in El Salvador, capital of the department of Santa Ana (area, 767 sq. m.; pop., 1960, 283,176). It is located on the northeastern slope of Santa Ana volcano (*ca.* 8,000 ft.) at an altitude of *ca.* 2,300 ft. The area is noted for its coffee. A major commercial center, Santa Ana is the second-largest city in El Salvador. Population, 1960, 140,332.

Santa Anna (*sän′tä ä′nä*) or SANTA ANA, ANTONIO LÓPEZ DE, soldier and politician, born in Jalapa, Mexico, Feb. 21, 1795(?); died in Mexico City, June 20, 1876. Santa Anna was a cadet in the Spanish army in Mexico at the age of 15. He fought against Mexican insurgents until 1821, when he supported Gen. Agustín de Iturbide (*q.v.*) in his attempts to set up an independent government. Iturbide's arbitrary rule (as Agustín I, emperor of Mexico) excited considerable opposition, and Santa Anna headed the republicans who turned against him late in 1822. Personal despotisms remained characteristic of Mexican politics for more than 30 years, in which Santa Anna and Anastasio Bustamante (1780-1853) were often political rivals. Santa Anna, elected president in 1833, put down a revolt in 1835 and subsequently assumed dictatorial powers. He centralized the government, antagonizing, particularly, the settlers in Texas, who revolted in 1836 (see *Texas:* HISTORY). He became infamous to Americans through his brutal massacre of the defenders of the Alamo (*q.v.*). Defeated at the battle of San Jacinto (*q.v.*) by Sam Houston's forces, he was taken prisoner. A treaty recognizing Texan independence, which he signed, was repudiated by the Mexican government after his release. Removed from office, Santa Anna went to the U.S. In 1837 he returned to Mexico and lived in retirement until the French invasion (1838) of Veracruz made him a hero—he lost a leg in the city's defense. Newly popular, he became (1839) leader of the Centralist faction and subsequently regained control of the government. Elected president again under the new constitution of 1843, he was brought down by another rebellion in 1845. He was banished, only to be recalled to head the Mexicans (as generalissimo and provisional president) in the Mexican War (*q.v.*). His armies were defeated at Buena Vista, Cerro Gordo, and Chapultepec. When Mexico City fell, he again went into exile. Santa Anna, made president once more by an army revolt in 1853, was overthrown—by the revolution of Ayutla (1855)—and exiled. An amnesty brought him back to Mexico in 1874, after the death of Benito P. Juárez (*q.v.*). He died in obscurity.

Santa Barbara (*săn′tạ bär′bạ-rä*), a city in southwestern California, seat of Santa Barbara County, *ca.* 80 m. N.W. of Los Angeles, on a slope of the Santa Ynez Mts., facing the Pacific Ocean. The city is served by the Southern Pacific Lines. It is surrounded by an agricultural region, which produces lemons, truck crops, and livestock. Santa Barbara's industries include electronics, plastics, aircraft, and engineering firms. The city is the center of a standard metropolitan statistical area (2,738 sq. m.; pop., 1960, 168,962) which includes all of Santa Barbara County. The area had a value added by manufacture of $31,371,000 in 1958. The city's value added was $21,805,000. Santa Barbara Campus of the Univ. of California, Westmont Coll., and a city college are located here. The city was incorporated in 1850. Population, 1950, 44,913; in 1960, 58,768.

Santa Barbara Islands, a chain of islands in California, lying off the state's southern coast. Separated from the mainland by the Santa Barbara and San Pedro channels, the chain extends for some 160 m. along the coast. It comprises the islands of Anacapa, San Clemente, San Miguel, San Nicolas, Santa Barbara, Santa Catalina (*q.v.*), Santa Cruz, and Santa Rosa.

Santa Catalina (*săn′tạ ḳăt-′l-ē′nạ*) or CATALINA, one of the Santa Barbara Islands (*q.v.*), part of Los Angeles County, 26 m. S. of Long Beach. Famous as a resort and deep-sea fishing area, it is connected to the U.S. mainland by steamer service and an airline. The mountainous island is *ca.* 22 m. long and ½ m. to 8 m. wide. Avalon, its principal town (pop., 1960, 1,536), is located on a small bay at the southeastern end of the island.

Santa Clara (*săn′tạ ḳlâr′ạ*), a city in western California, in Santa Clara County, 5 m. N.W. of San Jose. The city is served by the Southern Pacific Lines. Set in a fertile valley, it has industries centering around canned and dried fruits, dairying, and poultry raising. Santa Clara is in the San Jose standard metropolitan statistical area and had a value added by manufacture in 1958 of $48,425,000. It is the seat of the Univ. of Santa Clara. The city experienced its greatest growth in the decade 1950-60, when the population increased from 11,702 to 58,880.

Santa Claus (*săn'tạ ḳlạz*), the name of a friend of children, who, according to folklore, brings presents on Christmas eve. He is usually represented as an aged but jolly man who drives over the roads (or, sometimes, through the air) in a sleigh drawn by reindeer, and descends chimneys to fill with gifts the stockings hung up to receive them. It is said that he sometimes leaves a birch rod in the stocking of a naughty child. The name Santa Claus was derived from St. Nicholas, the patron saint of children, and is of German origin, but the legend was first brought to America by the Dutch settlers of New York. The feast was celebrated originally on Dec. 6 and that day is still observed in some parts of Europe, but it is now held generally at Christmas.

Santa Cruz (*săn'tạ ḳrōōz*), a city in western California, seat of Santa Cruz County, 72 m. S.E. of San Francisco, on Monterey Bay. The city is served by the Southern Pacific Lines. Santa Cruz has both agricultural and manufacturing industries. Principal crops are lettuce, apples, cherries, Brussels sprouts, berries, and cereal grains. Manufactured products include asphalt rock, lime, leather, incubators, ceramics, textiles, and lumber (chiefly redwood). The value added by manufacture in 1958 amounted to $11,865,000. Santa Cruz is famous as a beach resort and park area. Nearby state parks contain giant redwoods, known for their great size and age. The city was founded by Franciscan monks in 1791 and was incorporated in 1866. Population, 1950, 21,790; in 1960, 25,596.

Santa Cruz, a city of Bolivia, capital of the department of Santa Cruz, about 165 m. N.E. of Sucre. It is situated in the valley of the Mamore River and is surrounded by fertile country. In the vicinity are vast forests. Many of the buildings are of timber, but some are of stone and brick. It has a growing inland trade. Population, 1960, 66,548.

Santa Cruz de Tenerife (*sän'tạ crōōz dā tā-nâ-rē'fâ*), the capital and chief port of the Canary Islands, on the northeast coast of Tenerife. The harbor is the best in the Canary group, protected by moles and furnishing safe anchorage for great numbers of ships. It has a large import and export trade and manufactures of wine, cochineal, and utensils. The city is defended by several forts. Population, 1960, 490,655.

Santa Fe (*săn'tạ fā*), a city in north central New Mexico, capital of the state, seat of Santa Fe County, *ca.* 63 m. N.E. of Albuquerque, on the Santa Fe River. The city occupies a site 6,954 ft. above sea level, in view of the Sangre de Cristo and Jémez Mts. It is served by the Atchison, Topeka and Santa Fe Ry. Among the city's industries are weaving, mining of gypsum, and the manufacture of electronic components. The soil is semiarid, the climate dry, so that only a limited amount of agriculture and cattle-raising is possible. Tourism is by far the most important single industry of the city. Santa Fe is a tricultural city, fusing American, Spanish, and Indian influences. Among the noteworthy and historic buildings of the city are the Palace of the Governors (built 1610-12, now housing the Museum of New Mexico), the State Art Museum, La Fonda, the Museum of Navaho Ceremonial Art, the San Miguel Chapel, the Cathedral of San Francisco de Asis (Roman Catholic), the Cristo Rey Church (1761), and many nearby Indian pueblos.

The city was officially founded (1610) by Gov.

Art Museum, Santa Fe, New Mexico

IN SANTA FE, NEW MEXICO

Don Pedro de Peralta. Taken by the Pueblo Indians, who revolted against Spanish rule in 1680, it was recaptured by the Spaniards in 1692. In 1821, a revolution against Spanish authority resulted in independence. A small American army under Gen. Stephen Watts Kearny approached the city in 1846, and Santa Fe fell without the firing of a shot. The city became the capital of New Mexico in 1912. Population, 1950, 27,998; in 1960, 33,394.

Santa Fe (*sän'tä fā'*), a city in east central Argentina, capital of the province of Santa Fe (area, 51,334 sq. m.; pop., 1960, *ca.* 2,106,000), 230 m. N.W. of Buenos Aires. It occupies a low site at the junction of the Salado and Paraná rivers. The surrounding country produces fruits and cereals. The city has railroad and river trade in timber, hides, and cereals. Shipbuilding is the principal industry. Among the manufactures are tile, macaroni, oil, clothing, and machinery. It has a Catholic cathedral and a Jesuit college. The city was founded in 1573. Population, 1947, 168,011; in 1960, 219,620.

Santa Fe Trail, a wagon route between Missouri and Santa Fe, N.M., used from 1821 to 1880 for transport of commercial goods. The trail was opened by William Becknell after Mexico had overthrown Spanish rule (which had resisted U.S. attempts to establish trade in Santa Fe). The route was well used: in one 12-month period (1848-49) 12,000 persons, 50,000 animals, and 3,000 wagons traveled along it. The trail fell into disuse after a railroad was built linking Santa Fe with Topeka, Kans.

Santa Maria (*săn'tạ mạ-rē'ă*), a city in southwestern California, 52 m. N.W. of Santa Barbara. It is served by the Santa Maria Valley R.R. (freight). Industries are chiefly agricultural: stock raising, dairying, and fruit growing. The city is part of the Santa Barbara standard metropolitan statistical area. Its value added by manufacture in 1958 was $2,405,000. The city, founded in 1871, was incorporated in 1905. Population, 1950, 10,440; in 1960, 20,027.

Santa Maura (*sän'tä mou'rä*). See *Leucadia.*

Santa Monica (*săn'tạ mŏn'ĭ-kạ*), a city in southwestern California, in Los Angeles County, 15 m. w. of Los Angeles, on the Pacific Ocean. It is served by the Union Pacific, Southern Pacific, and other R.R.'s. Manufactures include aircraft, cosmetics, toys, and sportswear. Part of the Los Angeles-Long Beach S.M.S.A., the city had a value added by manufacture of $342,076,000 in 1958. Santa Monica was incorporated in 1886 and chartered in 1902. Population, 1950, 71,595; 1960, 83,249.

Santander (*sän-tän-dĕr'*), a seaport in northern Spain, capital of the province of Santander, on the Bay of Biscay. It has a large trade in cereals, fruits, livestock, and merchandise, and products manufactured in the city include sailcloth, chemicals, and cured fish. Population, 1960, 118,435.

Santa Rosa (*săn'tạ rō'zạ*), a city in western California, seat of Sonoma County, 52 m. N. of San Francisco. It is served by the Southern Pacific Lines. The major industries of Santa Rosa include brewing, winemaking, fruit packing, and the manufacture of shoes and chemicals. The city had a value added by manufacture in 1958 of $5,488,000. The Cathedral of St. Eugene (Roman Catholic) is located in Santa Rosa, and the city also has a junior college. The city was settled about 1830 and was incorporated in 1867. Population, 1950, 17,902; in 1960, 31,027.

Santayana (*sän-tä-yä'nä*), GEORGE, philosopher, born in Madrid, Spain, Dec. 16, 1863; died in Rome, Italy, Sept. 26, 1952. He is considered one of the foremost contemporary thinkers professing a thoroughgoing naturalistic outlook on the world. Of Spanish Catholic parentage, he was brought to the U.S. as a child and completed his education at Harvard Univ., where he eventually became professor of philosophy (1896-1912). He retired from teaching in 1912 and made his home first in France and later in Italy.

Though Santayana's writings are marked by unusual literary and poetical felicity and by the absence of any technical philosophical apparatus, he was practically unknown to the general public until the appearance of his novel, "The Last Puritan" (1935). While he had a small but enthusiastic following among professional philosophers almost from the turn of the 20th century, his views suffered relative neglect from his professional colleagues for some time. He, nevertheless, seems destined to remain one of the classic figures in the history of American philosophy. One reason for the neglect which he endured during most of his life lies in his detached attitude toward the pressing problems of the day and in the poetic, sometimes almost oracular, expression he gave to his ideas. Moreover, he was outspoken in his antipathy toward the post-Kantian romantic philosophies which dominated the intellectual scene in America in the pre- and post-World War I period. His primary intellectual attachments were to the ancient Greek thinkers, especially Aristotle (*q.v.*) and among the moderns to Spinoza (*q.v.*); his thought and writings were steeped in the traditions of Latin Christianity, which seem foreign to highly industrialized, Protestant societies.

Santayana combined in his philosophy an undisguised atheistic materialism with respect to the causes or conditions of existence and an unusually perceptive sympathy for other worldly values and the life of the spirit. He thus maintained that disembodied forms, ideals, or values have no causal efficacy, that the operative agents in the executive order of nature are material bodies, and that belief in the power of ideals or values to direct the course of events is a species of superstition. On the other hand, though every living creature including man has a material basis for its existence, it may have goals of activity which are not material in character; in particular, its native capacities may be directed to ideal values whose adequacy and validity are not to be judged simply in terms of their material origins. The imaginative contemplation of ideal values which, though rooted in men's animal bodies, subsist in a different dimension of being than do physical things is, according to Santayana, the chief glory of man and the source of the greatest satisfaction to him. The kernel of Santayana's philosophy is thus contained in his remark that "Spirit is the last bubble in the ferment of matter. It is useless, for it is the end of things; but it is not vain, for it saves all else from vanity."

It is from this perspective that in the "Life of Reason" (5 vols., 1905-06) Santayana surveyed various human institutions and phases of human progress. In this work he examined the material bases and natural functions of society, art, religion, and science, and portrayed with remarkable perception the values these institutions possess for enhancing and making significant human existence. The life of reason as he thus conceived it is not a remote, mysterious, abstract intellectual exercise; neither is it a life primarily devoted to the conquest of material nature, or to a romantic effort to amass the maximum of novel experiences. It is a form of human activity grounded in the physical and biological nature of man, controlled by a discriminating attention to the facts of existence, directed in part toward the satisfaction of man's inherent needs and capacities, and culminating in an imaginative vision of the perfections which are at best only incompletely embodied in the flux of events.

In more recent writings, especially in his "Skepticism and Animal Faith" (1923) and "Realms of Being" (4 vols., 1927-40), Santayana made more explicit the metaphysics and the epistemology which underlay his moral philosophy. According to him, what the mind can directly apprehend is some portion of an indefinite realm of eternal essences that do not exist in time or space but have the status of Platonic Forms or Ideas. Some of these essences become embodied or realized in the spatio-temporal world, though most of them never are. However, the material substratum in which essences become actualized cannot be demonstrated to exist, though its existence is constantly assumed in all practical action; belief in the existence of matter thus involves an act of animal faith, not a question of logical proof. Santayana portrayed vividly and imaginatively the main characteristics of the four realms of being which he distinguished: the realms of essence, matter, truth, and spirit; and he offered a brilliant exposition of the intellectual and moral difficulties which emerge when the realm of essence is confounded with the realm of matter or existence.

GEORGE SANTAYANA

In addition to the works cited, Santayana's books include: "Interpretations of Poetry and Religion" (1900), "Winds of Doctrine" (1913), "Persons and Places," a three-volume autobiography (1943-53), "The Idea of Christ in the Gospels" (1946), and "Dominations and Powers" (1951).

Santiago (*săn-tē-ä'gō*), the capital of Chile and of Santiago Province, located *ca.* 115 m. S.E. of Valparaiso, on the Mapocho River, about 1,700 ft. above sea level. It is surrounded by the Andes Mts. and rests on a wide, beautiful plain. The city is regularly laid out, with broad streets, many public squares, fine residences, and imposing buildings, both private and official. The cathedral, erected by Pedro de Valdivia, was destroyed by earthquake in 1647, and rebuilt with rich interior decorations about 1748. Other noteworthy buildings include the capitol; the Moneda, or executive mansion; the palace of justice; the department of posts and telegraph; the exposition palace, which houses the national museum; the Univ. of Chile (1842); the national library of 100,000 volumes; the School of Arts and Trades; the national conservatory of music; the medical school; the astronomical observatory; the national institute; the mint; and a municipal theater. Breweries, flour mills, wood-working plants, foundries, machine shops, tanneries, knitting mills, soap factories, and factories for the manufacture of various articles of clothing comprise the chief industries. There are rail connections with the port of Valparaiso, and with Mendoza in Argentina. Founded in 1541 by Pedro de Valdivia, Santiago has suffered much from revolutions and earthquakes. In 1817, the town was captured by the

Courtesy Grace Line

VIEW OF SANTIAGO, CHILE

liberator, José de San Martín, following the defeat of Spanish forces. In 1923, it was the scene of the Fifth International Conference of American States. Population, 1960 (est.), 1,169,400.

Santiago, BATTLE OF, a naval engagement of the Spanish-American War, which occurred on July 3, 1908, off the coast of Cuba. The U.S. squadron was under command of William T. Sampson and Winfield S. Schley (*qq.v.*), who had confined the Spanish squadron, commanded by Adm. Cervera y Topete (*q.v.*), in the harbor of Santiago de Cuba. Lieutenant R. H. Hobson (*q.v.*) had previously sunk the collier *Merrimac* in the channel to the harbor and the American army was completing the occupation of the city. Cervera made a bold dash to escape on the morning of July 3, but was immediately attacked and pursued by the Americans under Schley. The fighting continued most of the day, but the Spanish lost 510 men killed and wounded and all of their vessels. One American was killed and ten were wounded.

Santiago de Cuba (*sän-tyä'gô THâ ḳo͞o'vä*) or SANTIAGO, a port city in southeastern Cuba, capital of Oriente Province, 460 m. S.E. of Havana. Situated in a rich agricultural area, near iron, copper, and manganese mines, it is an important port. It exports sugar, coffee, fruit, honey, tobacco, hides, beeswax, lumber, and mineral ores. Its manufactures include cigars, soap, matches, machinery, preserves, and rum; it has sugar refineries, distilleries, sawmills, and tanneries. The city is set among mountains, and nearby, to the east, is historic San Juan Hill. At the entrance to the harbor stands Morro Castle, an ancient fort, and the oldest cathedral on the island is here. Founded by Diego de Velásquez in 1514, the city was the capital of Cuba until 1589. During early times it was sacked by English and French buccaneers. In the Spanish-American War (*q.v.*) it was a center of military action before being taken by U.S. forces. Population, 1953, 163,237.

Santo Domingo (*săn'tō dô-mĭng'gô*), capital of the Dominican Republic, in the southwestern part, in the District of Santo Domingo, at the mouth of the Ozama River, 150 m. E. of Port-au-Prince,. Haiti. Largest city of the Dominican Republic, it is also the industrial, cultural, and social center. It is located on an artificial harbor, in a fertile tropical region. It exports molasses, sugar, cacao, hides, and timber. Industries include breweries, alcohol and liquor distilleries, meatpacking plants, and the manufacturing of soap, vegetable oil, chocolate, shoes, clothing, and furniture. Nearby beaches have made the city a popular resort. There are still many old colonial buildings; the 16th-century cathedral contains the tomb of Christopher Columbus. The city was founded in 1496 by Bartholomew Columbus, brother of Christopher, and is the oldest continuously inhabited European settlement in the Western Hemisphere. It served as a base for the expeditions of Hernando Cortez, Vasco Núñez de Balboa (*qq.v.*), and other conquistadors. From 1936 to 1961 it was called Ciudad Trujillo, after the ruler of the country at that time, Rafael Trujillo Molina. Population, 1960, 462,192.

Santonin (*săn'tō-nĭn*), colorless, odorless, slightly bitter crystals which become yellow when exposed to light. Formerly used as an anthelmintic in medicine, the chemical can be poisonous in overdose.

Santos (*săn'tŭs*), a city in southeastern Brazil, in the state of São Paulo, 33 m. S.E. of the city of São Paulo, with which it is connected by a railroad. The city has a spacious harbor and a large trade in coffee, wheat, sugar, and fruit. It is the most important coffee-exporting port in the world. It has manufactures of clothing, utensils, tobacco products, and machinery and is also a vacation resort. It was settled about 1543. Population, 1960, 265,753.

Santos-Dumont (*sănn'to͞oz-dü-môn'*), ALBERTO, pioneer aeronaut, born in São Paulo, Brazil, July 20, 1873; died there, July 24, 1932. He lived in France from 1891 to 1928. Becoming interested in aeronautics, he devoted himself to perfecting a navigable balloon. In 1898 he made the first flight in a gasoline-powered airship and in 1901 won an award offered by Henri Deutsch to the first person who could fly around the Eiffel Tower. He built (1903) an airship base near Paris, where he moored his blimps. In 1905 he began constructing airplanes and made his first flight in one in 1906. By 1909 he had built a successful small monoplane. "My Airships: A Story of My Life" was published in 1904. See also *Aviation*.

VIEW OF SÃO PAULO, BRAZIL

São Francisco (*soun frăn-sēsh'k̹ōō*), a river in eastern Brazil which rises in the province of Minas Gerais, about 125 m. N.E. of the city of Belo Horizonte. About 1,800 m. long, it has a general northeasterly course to Cabrobó, where it turns toward the southeast and flows into the Atlantic near Maceió, traversing the states of Minas Gerais, Bahia, Pernambuco, Alagoas, and Sergipe. The river has played a great part in Brazilian history and was an artery by which the Portuguese penetrated the interior. It flows through a large part of the Brazilian Highlands, and in its upper regions are the celebrated Brazilian diamond fields. It is navigable for large vessels to the Falls of Paulo Afonso, a distance of 140 m. from its mouth. These falls, 275 ft. high, are among the most remarkable in the Americas. The river is navigable for 900 m. above the falls.

Saône (*sōn*), a river in eastern France, the largest tributary of the Rhone. It rises in the department of Vosges and joins the Rhone at Lyons, after a course of 268 m. Its chief tributary is the Doubs. Canals connect it with the Moselle, the Loire, the Marne, and the Yonne. It is navigable for a distance of 190 m.

Saône-et-Loire (*sōn'ā-lwär'*), a department in east central France, bounded by Côte-d'Or on the N., Jura and Ain on the E., Ain, Rhône, and Loire on the S., and Allier and Nièvre on the W. It contains fertile fields and gently sloping hills rich in vineyards. Comprising part of the old province of Burgundy, its 3,330 sq. m. produce not only wines but also cereals, vegetables, and hemp; cattle and poultry are raised. Coal and iron mining as well as textile, glass, and other industries are to be found in Saône-et-Loire. Mâcon is its capital. Population, 1954, 511,182.

São Paulo (*sounm pou'lōō*), a city in southeastern Brazil, capital of São Paulo State, on the Tietê River, *ca.* 40 m. N.W. of Santos. The city stands on a plateau *ca.* 2,700 ft. high, separated from the coast by a great escarpment. The most populous city of Brazil and the leading industrial center, it produces steel and wire products, machinery, automobiles, tires, radios, cutlery, glass, furniture, pianos, lumber, chemicals, paper, textiles, clothing, and leather goods. Food industries include meat packing, flour milling, canning, and production of corn starch, beverages, and vegetable oils. The city is also important commercially, dealing in the agricultural output of the interior. Coffee and cotton have the largest volume, followed by corn, rice, citrus fruits, dairy products, livestock, and vegetables. The city has a temperate climate and resembles a large U.S. city with its central skyscraper complex and residential suburbs. It is the seat of both a state and a Catholic university. It was founded by Jesuits in 1554; on a nearby plain Brazil was declared independent, Sept. 7, 1822. The growth of the city was slow until 1885, when coffee cultivation became widespread throughout the state and was followed by large-scale immigration, especially of Italians and Japanese. Population, 1960, 3,776,581.

Sap (*săp*), the liquid found in growing plants, which serves a function in plant life as important as the function of blood in animals. In it take place the changes necessary for vegetable growth. It is formed by the roots as crude sap from materials taken up from the soil. After passing from cell to cell by a process known as *endosmosis,* it ascends to the leaves. There it undergoes chemical changes through the influence of light, especially the absorption of carbon dioxide from the air and the formation of sap elements. It now takes the name of *elaborated sap* and descends mainly through the bark, forming on its downward course the new growth to build up the plant. The ascent is with great rapidity in a zigzag course, but it is most copious in the spring, while at the beginning of winter it ceases entirely. The movement of sap in trees is one of the early signs of the return of spring in temperate and cold zones. Many plants yield sap that is of value in medicine and industry.

Sapajou (*săp′ạ-jōō*), a monkey native to America. See *Capuchin.*

Sapir (*sạ-pĭr′*), EDWARD, anthropologist and linguist, born in Lauenburg, Pomerania, Jan. 26, 1884; died in New Haven, Conn., Feb. 4, 1939. He was graduated from Columbia Univ. and received a doctorate in 1909. After teaching at the universities of California and Pennsylvania, he headed (1910-25) the anthropological department at the Canadian National Museum. He was a professor of anthropology and linguistics at the Univ. of Chicago (1925-31), and at Yale Univ. from 1931 until his death. A specialist in the languages of the American Indians, he developed scientific methods of studying language. His books include "Language, an Introduction to the Study of Speech" (1921) and "Nootka Texts" (1939).

Saponin (*săp′ō-nĭn*), a carbohydrate substance found in many plants, notably the soap plant. It products a soapy lather, and is used in detergents and cleansers.

Sapotaceae (*săp-ō-tā′-sê-ē*), an order of tropical shrubs and trees. Some have edible fruit, some yield valuable oils, others gutta-percha (*q.v.*). Chicle (*q.v.*), the base for chewing gum, is derived from one species.

Sapphire (*săf′ĭr*), a precious stone of blue corundum, in value and hardness frequently next to the diamond. The ruby is a reddish-colored stone of the same family. The sapphire is usually a transparent blue, but there are sapphires of various colors. The oriental varieties of the topaz, emerald, and amethyst are actually yellow, green, and violet sapphires, respectively. Other types are colorless or milky. Sapphires often are six-sided crystals with prismatic or pyramidal characteristics. The star sapphire reflects light in a six-rayed star. The most valuable sapphires are found in Ceylon, Burma, Thailand, and Kashmir. They are also found in the U.S., particularly Montana, and Australia. See also color plate, *Precious Stones,* Volume IX.

Sappho (*săf′ō*), poetess, born in Mytilene, on the island of Lesbos, Greece, *ca.* 612 B.C. Little is known of her life and nothing of her death, except that she was of noble birth, and that she married Cercylas and had a daughter, Cleïs. She was a friend of the poet Alcaeus (*q.v.*). In her early years she was exiled briefly to Sicily, probably for political reasons. Her work, comprising personal love poems, folk poems, and wedding songs, was no doubt written chiefly in connection with the school she maintained to teach young girls of Lesbos music, singing, and the art of gracious living. Her love lyrics, metrically excellent (the Sapphic meter is named after her), are remarkable for their intensity and brilliance and the beauty of their imagery. Before 1900, knowledge of her poems came from ancient authors, but fragments of her work were uncovered later; the longest is an ode to Aphrodite, goddess of love and beauty.

Sapporo (*säp-pô-rô*), largest city and capital of Hokkaido Island, Japan. It is an industrial and cultural center whose manufactures include condensed milk, hemp, processed soybeans, and rubber goods. It is the seat of Hokkaido Imperial Univ. (1918). The city was laid out in 1871. Population, 1958, 349,671.

Sapsucker (*săp′sŭk-ẽr*), a common North American woodpecker. It is about 8 in. in size, with a red head patterned with white and blue-black and yellowish underparts. It receives its name from its manner of feeding: it makes little pits through the bark of trees, and it feeds on the flowing sap and on the insects attracted to it. It breeds in Canada; the Eastern Seaboard as far south as Virginia; and Ohio, Missouri, New Mexico, and California.

Saracens (*săr′ạ-sĕnz*), the name applied to Arabs and, by extension, to all Moslems, in the Middle Ages and later. The name was originally (from the 1st century A.D.) used to designate the Bedouins (*q.v.*) who lived in the Mesopotamian and Syrian deserts. The Moslems in Spain and Portugal were known as Moors (*q.v.*). In the 8th century, the Saracens invaded France, but they were defeated by Charles Martel at Poitiers. They held Sicily from the 9th to the 11th centuries and left many examples of their art and architecture.

Saracoglu (*sä-räj′ô-glōō′*), SÜKRÜ, statesman, born in Odemis, Turkey, in 1887; died in Istanbul, Dec. 27, 1953. He was educated in Turkey and Switzerland and received a law degree from the Univ. of Lausanne. He supported Kemal Pasha (*q.v.*) and in 1923 was elected to the great national assembly. He held various cabinet posts (1925-42) and was premier (1942-46). His administration maintained neutrality during World War II, but shortly before the end of the conflict Turkey declared war on Germany and Japan. In 1948-50 Saracoglu was president of the national assembly.

Saragossa (*săr-ạ-gŏs′ạ*), in Spanish, ZARAGOZA, capital city of Saragossa province (pop., 1955, 641,552), on the Ebro River, 170 m. N.E. of Madrid. It is a key railway and manufacturing center, with canneries, flour and sugar mills, and metal and textile mills. Notable structures include a bridge built in 1447, a university (founded 1474), and two cathedrals.

Known in antiquity as Salduba, it was made a colony by the Romans in 25 B.C. It was captured by Germanic invaders A.D. 452 and 476 and by the Moors in 712, who held it until 1118, when it was taken by Alfonso I of Aragon. During the

Peninsular War, the city was defended against French assaults by poorly armed citizens, among whom was Agustina, "Maid of Saragossa," whose exploits are recorded in "Childe Harold" by Byron. Population, 1955, 281,145.

Sarajevo (*sä′rä-yĕ-vô*) or SERAJEVO, capital of Bosnia and Herzegovina in Yugoslavia, on the Miljacka River, *ca.* 157 m. s.w. of Belgrade. Sarajevo has machine shops and pottery and silk-weaving establishments. There is a Catholic cathedral and the Mosque of Husref Bey. The assassination of the Archduke Franz Ferdinand of Austria (*q.v.*) at Sarajevo in 1914 precipitated World War I (*q.v.*). Population, 1953, 135,657.

Sarasota (*săr-ạ-sō′tạ*), a city in Florida, seat of Sarasota County, situated on the Gulf of Mexico, 51 m. s. of Tampa. The city covers an area of 17 sq. m. and is served by the Atlantic Coast Line and the Seaboard Air Line R.R.'s. The Sarasota-Bradenton Airport is 6 m. N. of Five Points, the business center of the city.

Recreational and tourist attractions include Lido Beach; the Jungle Gardens, displaying tropical birds, flowers, trees, and shrubs; Horn's Cars of Yesterday and Music Box Arcade; and the Circus Hall of Fame, where relics of many circuses are on exhibit. The principal commercial activities of Sarasota are tourism and agriculture (citrus fruits, vegetables, and cattle).

Cultural and educational institutions and activities include the Ringling Museum of Art; the Ringling School of Art; Manatee Junior Coll.; and the Players, a group of amateur actors and actresses who have built their own theater.

The city government is administered by five commissioners, two of whom are elected each year for terms of varying length. The mayor is chosen each year from among the commissioners, who also employ the city manager.

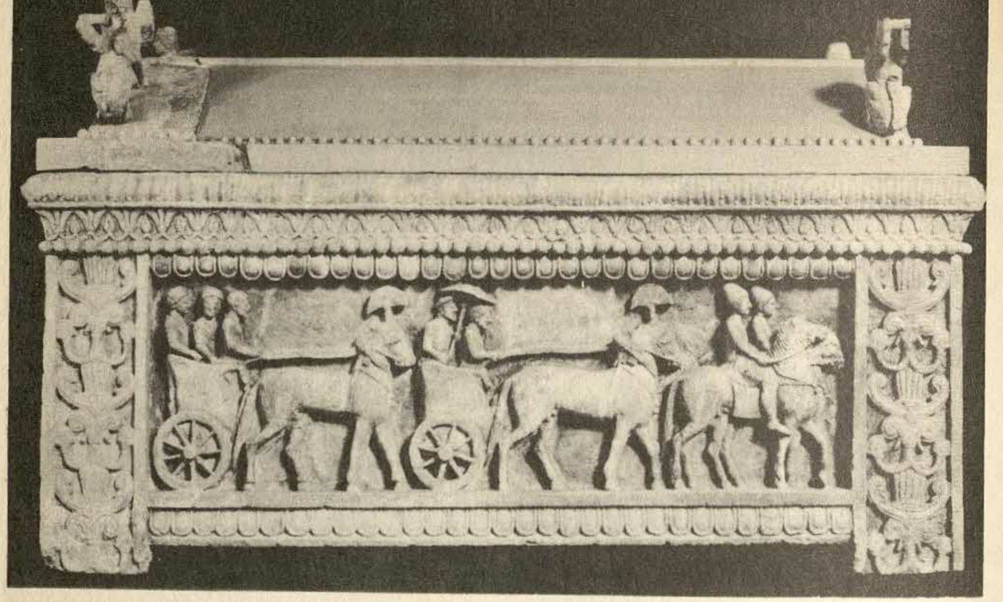
The first settlers came to Sarasota in the middle 1830's. A group known as the Ormiston Colony, who had bought land from a Scottish syndicate, arrived at the site in 1885, but the experiment failed and the area developed slowly. Sarasota was incorporated as a village in 1902 and became a city in 1914. In 1910 the population was 810; in 1930, 8,498; in 1950, 18,896; and in 1958 (est.), 40,000.

Saratoga (*săr-ạ-tō′gạ*), BATTLE OF, a decisive American victory in the Revolutionary War, fought near Saratoga, now Schuylerville, N.Y. The battle comprised two engagements in which the British fought under Gen. John Burgoyne and the Americans under Gen. Horatio Gates (*qq.v.*). Trying to occupy the Hudson Valley and to cut off the New England colonists from the rest of their countrymen, the British advanced on Bemis Heights (*ca.* 3 m. N. of Stillwater, N.Y.), where the Americans were entrenched. The first attack (Sept. 19, 1777) was repelled near Freeman's Farm, with the loss of 300 American casualties and 600 British. Failing to receive urgently requested help, Burgoyne attacked again on Oct. 7. Repelled and routed by a contingent under Benedict Arnold (*q.v.*), the British withdrew to Saratoga, counting 700 casualties, including prisoners, against the loss of *ca.* 150 colonists. Besieged in Saratoga, Burgoyne signed the Convention of Saratoga (Oct. 17), pledging that his forces would not serve against the Americans again; they were marched to Boston and returned to England. This victory greatly encouraged the French to negotiate an alliance with the Americans. The battle site is now a national historical park.

Saratoga Springs, a city in Saratoga County, New York, 30 m. N. of Albany, on the Delaware and Hudson R.R. Noted as a health and pleasure resort, with an annual transient population of *ca.* 50,000, it has many natural mineral springs on an 1,100-acre spa, which has been owned by New York State since 1909. The springs, first visited by a white man in 1767, have been in systematic use since 1774, and the water has been bottled and shipped since 1826. The first inn was erected here in 1791, and there are numerous other hotels, many dating from the 19th century. Horse racing, another local attraction, was begun in 1864. Saratoga Springs is the site of Skidmore Coll., the Simon Baruch Research Inst., and the Yaddo estate, a privately sponsored retreat for artists and writers. It is also known as a convention city. Its manufactures include highway equipment, chemicals, and wallpaper. Saratoga Springs was incorporated as a village in 1826 and as a city in 1915. Population, 1940, 13,705; in 1950, 15,473.

Saratov (*sŭ-rä′tôf*) or SARATOFF, a city in the U.S.S.R., capital of the Saratov region, on the Volga River, 220 m. N. of Stalingrad. It is a major commercial and railroad center in a semi-arid area which produces grains and vegetables. It is a natural-gas producing center. The manufactures include heavy and agricultural machinery, chemicals, textiles, and lumber; flour milling, oil refining, and shipbuilding are also carried on. Saratov has a university, several technical institutes, and two museums. Population, 1956 (est.), 518,000.

Sarcophagus (*sär-ḳŏf′ạ-gŭs*), a stone coffin or tomb, used to enclose a dead body. The wealthy classes of Egypt were the first to use sarcophagi, but later the practice extended to the inhabitants of the region of Asia bordering on the Mediterranean Sea, particularly to the Phoenicians, Carthaginians, Persians, Greeks, and Romans. Many of these tombs were decorated and ornamented with elaborate carvings and inscriptions. The most beautiful specimens were found in the Egyptian pyramids. Coffins of stone



Courtesy Metropolitan Museum of Art, N. Y.

GREEK SARCOPHAGUS, ABOUT 600-550 B.C.

have been used to some extent for royal or distinguished persons even in modern times.

Sard (*särd*), a reddish-brown species of chalcedony, distinguished from carnelian by the deepness of its color. When held between the eye and the light, it has a flesh-red color. The ancients prized it highly as a gem, and early writers credit it with having virtue in cheering the heart and encouraging the intellect. See *Chalcedony*.

Sardanapalus (*sär-dȧ-nȧ-pā′lŭs*), the Greek name of a number of kings of Assyria, one of whom was the last king of the Assyrian empire of Nineveh. The Greek writer Ctesias described him in terms that have made his name proverbial as the type of luxury. His oppression caused a Median satrap named Arbaces to join a native revolution against him in 785 B.C. This resulted in his army being defeated and withdrawn into Nineveh, where he was besieged for two years. When it became apparent that resistance was in vain, he gathered his vast treasures in his palace and set them on fire, both he and his numerous wives perishing in the flames. It is thought by some writers that the account given by Ctesias is not historical, and that the name is a corruption of Assurbanipal.

Sardine (*sär-dēn′*), a class of small fishes, belonging to the same genus as the herring and the pilchard, much valued as food. They are mostly canned in oil. This is done after salting and partly drying by pouring hot olive oil, or oil and butter, over them and sealing in a tin can. The young of the herring and menhaden are preserved in the same way in Canada and the U.S. Sardines are abundant in the Mediterranean and off the western coast of Europe, where they are caught and canned in large quantities. Anchovied sardines are those preserved in red wine.

Sardinia (*sär-dĭn′ĭ-ȧ*), an island in the Mediterranean, belonging to Italy, lying s. of Corsica. Next to Sicily it is the largest of the Mediterranean islands. It is separated from Corsica by the Strait of Bonifacio, a channel about 7 m. wide, and its shores are indented by numerous gulfs, including the gulfs of Asinara, Oristano, Palmas, Cagliari, and Orosei. The length from N. to S. is 160 m.; the width, 68 m.; and the area, 9,294 sq. m. The island comprises the three provinces of Cagliari, Nuoro, and Sassari, with a population of over 1,000,000. Cagliari, with about 100,000 inhabitants, is the capital.

Several mountain groups characterize different parts of the island. The most elevated peaks are in the eastern part. Many of them are chiefly of granite formation. Mt. Gennargentu, height 6,016 ft., is one of the highest peaks. The coasts are generally steep and rugged and near the shore are a number of small islands, but they are mostly off the northern and western coasts. The Tirso, flowing 94 m. into the Gulf of Oristano on the west coast, is the principal river. The climate is mild, with a temperature ranging from 30° to 90°, and there is ample rainfall. Both the climate and rainfall vary somewhat with elevation, but the most pleasant weather is experienced in autumn.

INDUSTRIES. The soil is generally fertile, especially in the valleys and coast regions, and there are an abundance of timber, fine fisheries, and valuable deposits of minerals. Among the mineral products are sulfates of iron and copper, arsenic, zinc, antimony, and lead. Agriculture is the principal occupation, though mining, manufacturing, and fishing have been developed considerably. The principal agricultural products include maize, wheat, beans, barley, tobacco, vegetables, oranges, lemons, and many other fruits. The fisheries yield sardines, tunny, anchovies, and coral. Cattle, horses, sheep, goats, and swine are raised. Among the manufactures are cotton textiles, silk and woolen fabrics, clothing, hardware, machinery, furniture, and cured fish. Several railroad lines penetrate different parts of the island, the most important being the line built from the Gulf of Asinara to the Gulf of Cagliari, which touches the coast of the Gulf of Oristano. There is daily steamer service between Terranova and Civitavecchia on the Italian mainland, and weekly steamers from Cagliari to Naples, Genoa, Palermo, Tunis, and Leghorn. A weekly French steamer runs between Porto Torres and Ajaccio in Corsica.

Sardinia forms a department of the Republic of Italy. The Sardinians, who had suffered little racial admixture since earliest times, belong to the Mediterranean stock. There are slight traces of Catalan and Genoese strains among the natives, who speak a dialect in which many Latin words have been kept intact. In the mountainous districts, the men retain a distinctive dress consisting of short black woolen kilt, black leggings, and a knitted stocking cap. The costume of the women varies considerably, but is characterized by the use of bright colors and many petticoats. Colorful festivals, with dances and bareback horse races, take place in the summer, attracting many tourists. About half the population is illiterate. There are universities at Cagliari and Sassari, and a mining school at Iglesias. Roman Catholic is the predominant religion.

HISTORY. The early history of Sardinia is wrapped in tradition, but it is reasonably certain that a high state of civilization was developed at the time of the greatest prosperity of Greece. It was known to the Greeks as Ichnusa. The Carthaginians conquered it about 480 B.C., and during their occupancy it became noted for its production of corn and fruits. It was made a Roman possession in 238 B.C. and was long noted as the granary of Rome. The Vandals, Goths, and Saracens successively conquered it after the fall of the Roman Empire, but the Eastern Empire recovered it in 534 A.D. Saracen invaders obtained a foothold a second time, but they were driven out by an allied army from Genoa and Pisa in 1022. The conquerors divided the island as two separate possessions. In 1416, it became a territory of the kings of Aragon and remained tributary to Spain until it was annexed by the British in 1708. The Treaty of Utrecht, in 1713, transferred it to Austria, and in 1720 it became a part of the kingdom of Sardinia under the House of Savoy. In 1792-93, the French attacked the island, but were repulsed by the inhabitants, who rebelled several years later against their ruler, Victor Amadeus III. Feudalism was abolished in 1836, and Sardinia was united politically with Piedmont in 1848. Victor Emmanuel II (*q.v.*), King of Sardinia, united Italy in 1861 and became the first king of united Italy. During World War II, the Germans held Sardinia until Sept. 20, 1943, when they evacuated the island before the advance of Fighting French forces and Italian troops loyal to the Badoglio (*q.v.*) government.

Sardinia, KINGDOM OF, formerly a kingdom of Europe, situated in the southern part of the continent. It was formed principally of the duchies of Savoy and Genoa, parts of Milan and Montferrat, the county of Nice, the principality of Piedmont, and the islands of Caprera and Sardinia. It had an area of 28,769 sq. m. and a population of 5,167,542. Victor Amadeus II, Duke of Savoy, in 1720 assumed the title of King of Sardinia. This he did in accordance with a treaty with Austria, which provided that he was to surrender Sicily and receive in exchange the island of Sardinia. The history of the kingdom is largely wrapped in the fortunes of war with Austria and other countries, and is important as bearing upon and forming the nucleus of the present kingdom of Italy. The last war of the kingdom was under Victor Emmanuel II, who formed an alliance with France against Austria in 1859. In 1861 he came into possession of all of Italy, except Rome and Venetia, and assumed the title of King of Italy instead of King of Sardinia. He added Venetia to the kingdom in 1866 and completed the union of Italy by annexing the papal states in 1870.

Sardis (*sär'dĭs*), or SARDES, the name of an ancient city in Asia Minor, capital of Lydia, on the Pactolus River, about 45 m. E. of Smyrna. The Greek writer Aeschylus made the first mention of the city. It was captured by the Cimmerians about 650 B.C. Its greatest prosperity was reached in the reign of Croesus, who became its king about 568 B.C., when it was in possession of fabulous wealth and power. The importance of Sardis was due to its military strength, the fertility of the surrounding country, and its location on the highway leading from the interior of Asia to the Aegean coast. The Athenians burned it in 503 B.C., and after the Roman conquest it was made a provincial government. Sardis is mentioned in the book of Revelation 16:1-5. It is said to have been the residence of both Xerxes and Cyrus the Great. Timur conquered it in 1402, when much of it was destroyed. The site is at present occupied by a dilapidated village called Sart.

Sardonyx (*sär'dô-nĭks*), a mineral of the quartz variety, so named because it contains layers of sard and white chalcedony. It is a kind of onyx, and is used quite extensively in making brooches and other forms of jewelry. In some specimens the color is orange or reddish yellow, while in others, it is red with white markings.

Sardou (*sär-dōō′*), VICTORIEN, dramatist, born in Paris, France, Sept. 7, 1831; died there, Nov. 8, 1908. Born of a family of humble circumstances, Sardou was forced at an early age to make his own way in life. His first play, produced in 1854, was a complete failure, and shortly thereafter he became seriously ill. But upon his recovery, he began to write again and achieved great success with three plays, beginning in 1859. They were followed by a long series of satiric and light comedies and historical dramas, which made Sardou one of the most popular dramatists of his time. His plays were written in French, but many were presented in English in the U.S., including "Uncle Sam" (1873), "La Tosca" (1887), which was the basis for Puccini's opera, "A Scrap of Paper" (1889), "Cleopatra" (1890) and "Madame Sans-Gêne" (1895), both written in collaboration with Émile Moreau, "Robespierre" (1899), and "Dante" (1903). He wrote a number of plays, including "La Tosca," for the actress Sarah Bernhardt (*q.v.*) and others for Sir Henry Irving (*q.v.*). In 1877 he was elected to the French Acad.

Sarema (*sä′rē-mä*), in Estonian, SAAREMAA, in German, ÖSEL (or OESEL), an island in the Baltic Sea, belonging to Estonia and located at the mouth of the Gulf of Riga; about 1,000 sq. m. in area. Conquered by the Teutonic Knights in 1227, it was ruled by its own bishops until control passed to the Danes in 1561. From 1645 to 1721 it was held by Sweden, and then by Russia until 1918, when it became part of Estonia. The surface of the island is generally low, making it ideal for dairy farming. The chief city and port is Kuressare.

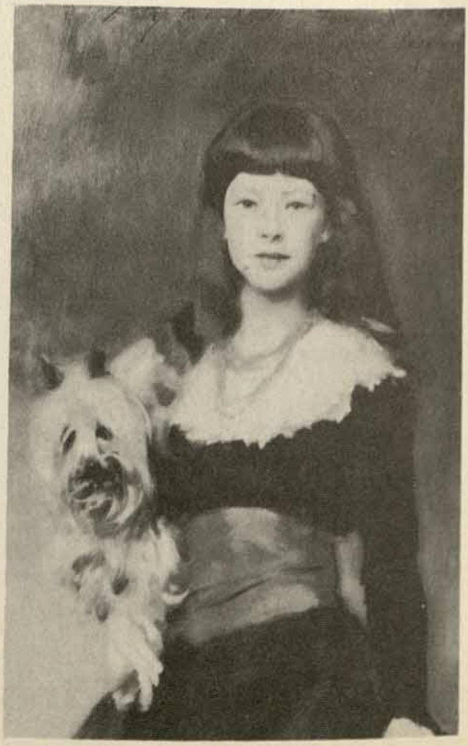
Sarg (*särg*), ANTHONY FREDERICK ("TONY"), illustrator and marionette maker, born in Guatemala, April 24, 1882; died in New York, N.Y., March 7, 1942. He was educated in Germany and served as an officer in the German army until 1905, when he went to London and embarked upon a career as an illustrator. In 1915 he came to the U.S., was naturalized in 1921, and thereafter made his home in New York City. For a time he devoted himself to drawing illustrations for humorous stories in such magazines as the *Saturday Evening Post* and *Collier's*, and originated the famous "Tony Sarg Marionettes." He also designed textiles, pottery, wallpapers, rugs, furniture, etc. for children and wrote several children's books, including "Tony Sarg's Animal Book" (1925), "Book of Marionette Plays" (1928), and "Tony Sarg's Wonder Book" (1941).

Sargent (*sär′jẹnt*), EPES, journalist and poet, born in Gloucester, Mass., Sept. 27, 1813; died in Boston, Dec. 30, 1880. He was graduated from the Boston Latin School in 1829 and later joined the editorial staff of the Boston *Daily Advertiser* and, subsequently, that of the Boston *Daily Atlas*. From about 1839 to 1847, he worked in New York on the New York *Mirror* and the *New World* and edited "The Modern Standard Drama" (7 vols., beginning in 1846). He then returned to Boston, where he edited the Boston *Daily Evening Transcript* until 1853, when he retired from newspaper work. Sargent wrote a number of biographies, including the "Life and Public Services of Henry Clay" (1842); a book of poetry, "Songs of the Sea with other Poems" (1847), which includes the song "A Life on the Ocean Wave"; and the dramas "The Bride of Genoa" (1836) and "Velasco" (1837).

Sargent, JOHN SINGER, painter, born in Florence, Italy, Jan. 12, 1856; died in London, England, April 15, 1925. His parents were American citizens living in Italy, and Sargent received his early instruction in painting at the Acad. of Fine Arts in Florence. His family moved to Paris in 1874, and he became a pupil of

MISS BEATRICE TOWNSEND
PAINTING BY JOHN S. SARGENT

Courtesy M. Knoedler & Co., N. Y.



Carolus Duran (1874-79), traveling occasionally to Italy and Spain. In France he was especially impressed by the work of Velásquez. After his stay in Paris he moved to London in 1884. He visited the U.S. in 1887 and several times afterward, staying in Boston and New York. Sargent's fame and popularity rest mainly on his portraits, which are famous for a noble and dignified approach combined with a warm color scheme and brilliant surface effects. Best known among the portraits are those of Robert Louis Stevenson, Edwin Booth, Theodore Roosevelt, and Henry G. Marquand. In addition, he received wide acclaim for his murals, including those in the Public Library and the Museum of Fine Arts in Boston, Mass., and the Widener Library of Harvard Univ.

Sargon (*sär′gŏn*), the name of several kings of Babylonian descent who reigned over Assyria. SARGON I, of Akkad, is assigned by most scholars to about 2450 B.C. He extended the dominion of his people far beyond the valley of the Euphrates. SARGON II succeeded Shalmaneser V as King of Assyria in 722 B.C. Samaria tried to defend itself against Sargon II, but he captured it after a siege of three years (II Kings 18:9-11). Sargon II then suppressed a revolt of the Medians and the Syrians. In 709 B.C. he subdued Babylon, and proclaimed himself governor of Babylonia. At that time the Assyrian empire extended to Cyprus and into Cilicia. Sargon II devoted much energy to the construction of buildings and highways. He died in 705 B.C. and was succeeded by his son, Sennacherib.

Sarmatians (*sär-mā′shạnz*), a powerful race of nomadic people of Europe and Asia, whom the Greek historian Herodotus in his history (IV: 21, 117) located on the eastern boundary of Scythia, beyond the Tanais (the present Don) River. Herodotus believed that they were descended from Scythian fathers and Amazons (IV: 110-117), and erroneously described their women as warriors who entered battle on horseback equipped with lance and spear. Actually the Sarmatians were a nomadic warrior people like the Scythians (*q.v.*), although they differed in a number of respects from them, and the women played no part in their military or political organization. The Sarmatians probably came originally from central Asia and were one of the Iranian group of Asiatic peoples. They spoke a language closely related to Persian. At first composed of various tribes, they gradually fused into a powerful nation, and in the middle of the 4th century B.C. began to supplant the Scythians proper on the plains of southern Russia, north of the Black Sea. They were divided into the Rhoxolani, the Iazyges, and the Alani. No nomadic peoples were more formidable in harassing the Roman frontiers than the Sarmatians. It is probable that they were finally conquered by the Goths late in the 4th century A.D. Much of the history of Sarmatia was recorded by Ptolemy, but the manner in which he speaks of Slavs, Finns, Goths, and other peoples of a barbarian nature makes it obvious that he applies the term loosely. The Sarmatians were not, as is sometimes assumed, destructive barbarians. Archaeological evidence indicates that they were a fresh wave of Iranian conquerors, who brought to Europe the new achievements of Iranian culture. Unlike the Scythians, they succeeded in making their way into the Greek cities on the Black Sea and in Iranizing them to no little extent.

DAVID SARNOFF

Sarnoff (*sär′nŏf*), DAVID, radio executive, born near Minsk, Russia, Feb. 27, 1891. Brought to the U.S. in 1900, he attended public school and taught himself telegraphy while working as a cable company messenger. Applying (1906) for a job as wireless operator with the Marconi Co. of America, he was hired as an office boy; in 1908 he was made a wireless operator, and in 1912 he gained notice when he picked up the distress message of the sinking liner *Titanic*. Advanced to positions of increasing responsibility with the Marconi Co. and then with the Radio Corp. of America, which absorbed Marconi in 1919, Sarnoff pioneered in development of commercial radio and television. He was president of R.C.A. (1930-48) and board chairman of R.C.A. (1948-) and N.B.C. (1934-55). During World War II he served with the U.S. Army as a brigadier general (1943-44).

Saros (*sā′rŏs*), a cycle of 18 years and 11 days, already known to the Chaldeans, during which very similar solar and lunar eclipses recur. It enabled early astronomers roughly to predict such phenomena.

Saroyan (*să-rō′yạn*), WILLIAM, writer and playwright, born in Fresno, Calif., Aug. 31, 1908, of Armenian descent. The exuberance and simplicity of Saroyan's writing, combined with frequent erratic behavior, have made him one of

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WILLIAM SAROYAN

the legendary authors of our time. His first published book was a collection of short stories, "The Daring Young Man on the Flying Trapeze" (1934), which was followed by "Little Children" (1937), "Love, Here Is My Hat" (1938), "My Name Is Aram" (1940), "The Human Comedy" (1942), which was later made into a successful motion picture, "The Adventures of Wesley Jackson" (1946), "Rock Wagram" (1951), and others. Among his plays are "My Heart's in the Highlands" (1939), "The Time of Your Life" (1939), for which he was awarded, but refused to accept, the Pulitzer Prize in 1940, and "The Beautiful People" (1941).

Sarpedon (*sär-pē'dŭn*), in Greek mythology, the son of Zeus and Europa, who founded a kingdom in Lycia where he lived as king for three generations. His grandson with the same name is mentioned in Homer's "Iliad." He is said to have fought courageously with the Trojans at Troy, but was slain by Patroclus. His brothers, Sleep and Death, carried his body back to Lycia, where his kinsmen gave him honorable burial.

Sarsaparilla (*sär-sȧ-pȧ-rĭl'lȧ*), any of several species of *Smilax* (in the lily family) growing in moist jungles from Mexico to Brazil. The plants are evergreen prickly climbers, with leathery, heart-shaped, pointed leaves, and cordlike roots up to 10 ft. long. The roots are mucilaginous, sweetish, and acrid; they are used in various combinations to treat certain blood diseases and to flavor root beer, sarsaparilla, and other beverages. Wild sarsaparilla (*Aralia nudicaulis*) and bristly sarsaparilla (*A. hispida*), native to eastern North America, are herbaceous perennials (1 to 3 ft. tall) in the ginseng family.

Sarthe (*särt*), a department in northwestern France, traversed by the Sarthe River. It is bounded on the N. by the department of Orne, on the N.E. by Eure-et-Loir, on the E. by Loir-et-Cher, on the S. by Indre-et-Loire and Maine-et-Loire, and on the W. by Mayenne. The capital is Le Mans (population, 1946, 100,455). Sarthe is principally devoted to agriculture; horses, cattle, and fowl are raised in considerable numbers. Industries include the mining of coal and the quarrying of marble. The area is 2,410 sq. m., and the population (1946), 412,214.

Sarto (*sär'tô*), ANDREA DEL, Florentine painter, born in Florence, Italy, in 1486; died there in 1530. After studying as a pupil of Pietro di Cosimo, he turned to fresco painting, soon achieving fame in this field, as well as in oil painting. Francis I invited him to Paris in 1518, where he painted many excellent works, among them "Charity," now in the Louvre. After returning to Florence in 1579, he devoted himself to sacred themes. In his well-balanced compositions (characterized by warm, sumptuous, and glowing colors with a fine distribution of light and dark shadows) he showed himself a true master of the High Renaissance. Best known among his works are the "Madonna of the Harpies," *"Madonna del Sacco,"* "Last Supper," and the *"Pietà,"* as well as a series of frescoes from the life of John the Baptist. He is the subject of a psychological poem by Robert Browning.

Sarton (*sär't'n*), GEORGE ALFRED LEON, science historian, born in Ghent, Belgium, Aug. 31, 1884; died in Cambridge, Mass., March 22, 1956. He was educated at the Univ. of Ghent. Sarton came to the U.S. in 1915 and was naturalized in 1924. He lectured on the history of science at George Washington Univ. (1915-16) and at Harvard (1916-18 *et seq.*), where he later was a professor (1940-51) and professor emeritus (after 1951). An associate of the Carnegie Institution, Washington, D.C., from 1918 to 1948, he was founder and editor of the international-

JEAN-PAUL SARTRE

ly known periodicals *Isis* and *Osiris*. His many books included a monumental "Introduction to the History of Science"; and he wrote numerous papers devoted to the culture of Arabia, Asiatic art, and specific persons and periods in the history of science.

Sartor Resartus (*sär′tòr rê-sär′tŭs*), Latin for "tailor retailored," the title of a series of essays by Thomas Carlyle (*q.v.*).

Sartre (*sär′tr′*), JEAN-PAUL, philosopher and author, born in Paris, France, June 21, 1905. He studied at the École Normale Supérieure and in 1929 became professor of philosophy at Le Havre. Later he went to the Lycée Condorcet in Paris in the same position, and while there he became the leader of the French existentialist movement (see *Existentialism*). His principal work is the philosophical treatise "Being and Nothingness" (1943), which explains existentialism as he sees it and has been called the "bible of existentialism." During World War II Sartre served in the French army, was captured by the Germans and spent a period in prison. After his release he was an important figure in the Resistance movement. During the war existentialism became a widespread popular philosophy in France, and Sartre thus emerged in the postwar period as one of the most prominent intellectual figures in the entire country. Sartre is as widely admired for his plays, which dramatize the basic doctrine of existentialism, as for his philosophical works. These plays include "The Flies," "No Exit," "The Respectful Prostitute," and "The Unburied Dead." In 1947 "The Age of Reason" and "The Reprieve," two volumes of his projected tetrology "The Road to Freedom" appeared in the U.S.; the third volume, "Troubled Sleep," came out in 1951. He is also known in the U.S. for "The Wall and Other Stories" (1948) and his first novel, "Nausea," written in 1938, published in English translation in 1949.

Saskatchewan (*săs-k̨ăch′ê-wŏn*), a river of Canada, which rises in the Rocky Mts. by two sources called the North and the South Saskatchewan. The two branches unite east of Prince Albert, in Saskatchewan, and flow eastward into Lake Winnipeg. The north branch is 760 m. long and the south branch, 550 m. The distance from their confluence to Lake Winnipeg is 280 m. In its course the Saskatchewan passes through Cedar Lake. Its valley is fertile and contains extensive and valuable forests. Navigable for *ca.* 1,000 m., the river was an important trade route before the railroads came. The river is frozen from the middle of November to the middle of April.

Saskatchewan, a province of the Dominion of Canada, formed in 1905, located in the west central part. It is bounded on the N. by the District of Mackenzie, on the E. by Manitoba, on the S. by the U.S. and on the W. by Alberta. The northern boundary is 265 m., and the southern is 375 m. long. The province has a length from north to south of 760 m. In form it resembles an upright oblong, whose base rests upon the boundary line of the U.S. The area is 251,700 sq. m., of which 8,892 sq. m. are water.

DESCRIPTION. The surface is diversified, of an undulating character, and includes the principal part of the great valley of the Saskatchewan River. Three belts of prairie steppes lie parallel to the Rocky Mts., but are not very distinctly marked. The first of these crosses Manitoba and enters Saskatchewan, being a broken escarpment about 500 ft. high, and in the west central part of the province gives way to the forest belt of the north. It is pierced by the valley of the Red Deer River and extends toward the northwest as the Porcupine Mts. and Pasquia Hills. The second steppe, known in the U.S. as the Coteau du Missouri, extends in a northwesterly direction across the province and into Alberta. It is about 200 m. wide, has an altitude of 1,600 ft. above sea level, and is more or less broken into spurs and hills. In the southwestern part is the third steppe, which consists in part of a plain and in part of small plateaus. The general altitude ranges from 2,000 to 3,000 ft. above the sea, being highest on the border of Alberta. All of the southern part of the province may be described as a prairie country, which merges into a region broken by wooded areas in the central part, while the northern section is densely wooded with valuable timber.

The drainage belongs to four great basins, separated by low swells of ground. These basins include those of Lake Winnipeg and the Missouri, Churchill, and Mackenzie Rivers. The southwestern part lies in the basin of the Missouri and is drained by French Creek and Wood River, both of which cross the southern border and enter the Missouri in Montana. Through the south central part flows the Saskatchewan, which rises in Alberta and flows entirely through the province into Manitoba, where it discharges into Lake Winnipeg. The southeastern part is drained by the Souris or Mouse River, which makes a bold curve through North Dakota, thence enters Manitoba and joins the Assiniboine, which has its source in Saskatchewan. The Churchill drains a large section in the north central region, flowing eastward through Manitoba into Hudson Bay. The northwestern part is drained through Lake Athabasca, on the border of Alberta, toward the northwest, hence the overflow reaches the Arctic Ocean through the Mackenzie River. Many lakes are found in the central and northern parts, all rich in fish and surrounded by fine forests. Lake Athabasca, partly in Saskatchewan and partly in Alberta, is the largest area of water. Next in size is Wollaston Lake, in the northeastern part; it is drained in two directions, one outlet

National Film Board Photo

LAKE LA RONGE, SASKATCHEWAN

leading southward through Reindeer Lake and the Churchill, and the other toward Lake Athabasca and the Mackenzie.

The climate is continental, being very cold in winter and warm in summer. Rainfall is scant in the southern part, where it ranges from 12 to 20 in., while the central and northern portions have an abundance of precipitation. The summers are favorable to the cultivation of crops in the southern part, where irrigation is employed to some extent, but the northern section is not adapted to general farming. Snow falls to a depth of 1 or 2 ft. and the winters are long and cold, but quite clear. At Regina, in the south central part, the extremes range from 40° below zero to 90° above.

Agriculture. Saskatchewan's basic industry is agriculture, and 7 out of 10 of the population live off the land. One of the most productive grain areas in the world, Saskatchewan is the home of the world's best hard wheat; production of wheat rose from 26,000,000 bushels in 1905 to 321,000,000 bushels in 1928, the peak year. Principal crops include oats, barley, rye, flax, peas, alfalfa, hay, and fodder corn. Dairy farming is also carried on, and horse breeding is an important industry. In 1945 Saskatchewan was the second largest honey producer of the Dominion.

Mining. A large part of the area of the province may be classified as prospecting ground for oil and natural gas. Up to 1943, a total of only 116 gas and oil wells had been drilled; however, recent discoveries of oil and natural gas have led to increased development of these resources. A chemical plant at Ft. Saskatchewan employs petroleum by-products in its production of synthetics. Saskatchewan is one of the richest sources of uranium in Canada; two uranium mines have recently been opened on Beaver Lodge Lake, resulting in the transfer of mining operations from Lake Athabaska. The plains region in the south is rich in mineral-bearing sedimentary rocks, providing clays, coal, mineral salt, volcanic ash, bentonite, and other non-metallics. Gold has been mined on the north shores of Lake Athabaska, and nickel has been found on the border north of Black Lake; iron pyrite occurs in the Lac la Ronge area. The famous copper-zinc mine at Flin Flon, partly in Saskatchewan and partly in Manitoba, is served by a new railway built from a rich copper and nickel source newly discovered on Lynn Lake, Manitoba.

Valuable clays, used in products ranging from brick and tile to high-grade pottery, are widely distributed. The production of coal, mostly lignite, reached a total of 1,595,870 tons in 1950. Alkali deposits are also present.

Manufactures. The chief industries include flour and feed mills, electric-power production, butter and cheese making, meat packing, printing and publishing, breweries, and planing mills. In addition there are a number of industries owned and operated by the present Socialist government, established since it came to power in June 1944. They include manufacturing plants for leather, wool, and clay products, power plants, bus and air transport lines, fish filleting plants, and printing plants. In 1945 cooperative organizations numbered 1,035.

Transportation. There are more than 8,300 m. of provincial highways. Railway accommodation is provided by both the Canadian Pacific and Canadian National Ry. systems, which together have a total of about 7,000 m. of railway in the province. There is a direct connection with the Canadian National Ry. line to Churchill on Hudson Bay.

In 1945, the provincial government formed a Crown Corp. to operate a network of community-owned bus lines covering 3,300 m. Regina, the capital city, is a terminal for Trans-Canada Airlines.

GOVERNMENT. The lieutenant governor is appointed by the federal government of Canada and is assisted by an executive council. Legislative authority is vested in a unicameral body which is known as the legislative assembly; it is composed of 52 members elected by the people. All native-born and naturalized citizens may vote at the elections. The first Socialist government in North America came into power in Saskatchewan in June 1944, when the Cooperative Commonwealth Federation party (C.C.F.) won 47 of the 52 seats in the legislative assembly. In 1945 the legislature lowered the voting age to 18 years.

EDUCATION. The provincial system of education provides for elementary, secondary, and normal schools. There is a university at Saskatoon, as well as an agricultural college. Provision is made for technical education in urban and rural schools. The number of pupils enrolled in elementary schools was 138,882 in 1949. High school enrollment totaled 33,856.

FINANCES. Government expenditures for the fiscal year 1949-50 totaled $52,059,105, and revenue amounted to $52,303,302, a decrease of $3,000,000 from the previous year. The net public debt as of Dec. 31, 1949 was $147,913,814.

POPULATION. The southern part contains the larger number of inhabitants; in fact the northern section is at present almost entirely unoccupied, except by government officials and hunters. The greater number of people are of Canadian descent, but a large portion is made up of immigrants from the U.S. Regina, in the southern part, is the capital. Moose Jaw, in the southwest, is an important distributing point. Prince Albert, on the Saskatchewan, is noted as a railway and commercial center. Other towns include Saskatoon, Indian Head, Moosomin, and Yorkton. In 1901 the province had a population of 91,460. Rapid development, especially in the first decade of the 20th century, is evident from the fact that the population, according to a Dominion census in 1926, was 833,000; in 1936, 930,893. In 1950, it was estimated at 875,000.

HISTORY. Saskatchewan was first explored by French fur traders and they were succeeded by the employees of the Northwest Co., whose headquarters were at Montreal. The Hudson Bay Co. took control of the region in 1821 and held it until 1869. Settlements began to be made by that time, but the early development was slow, owing to a lack of transportation facilities. Regina was made the seat of civil government in 1882. Louis Riel became the leader of a rebellion in 1885, when about 35,000 Black Foot, Cree, and Ojibway Indians became dissatisfied because of the destruction of the buffalo and other wild animals utilized for food. A number of these Indians and many half-breeds constituted a formidable force, which was met in a final battle by Canadian troops under Gen. Middleton at Batoche on May 9. There the rebels were defeated after an engagement lasting four days. Riel was captured, tried for treason, convicted, and hanged. The government was that of a territory until 1905, when it was admitted as a province of the Dominion. It contains the larger part of the former districts of Assiniboia, Athabasca, and Saskatchewan.

Saskatoon (*săs-ḳȧ-tōōn′*), a city of Saskatchewan, on the Saskatchewan River and on the Canadian Pacific and the Canadian National R.R.'s. It has manufactures of brick, mattresses, flour, and machinery. Among the principal buildings are the courthouse, the Carnegie library, and Univ. of Saskatchewan. Population, *ca.* 46,000.

Sassafras (*săs′sȧ-frăs*), an extensive genus of plants, several species of which were once thought to have medicinal value. Sassafras trees are widely distributed from Canada to the Gulf of Mexico, ranging in size from a large tree 50 ft. in height to a small bush in the cold regions. The *sassafras-nut tree* of Brazil, the *plume-nutmeg tree* of Australia, and the *sassafras laurel* of California are allied species.

Sassoon (*să-sōōn′*), SIEGFRIED (LORRAINE), writer, born in London, Sept. 8, 1886. Educated at Cambridge, he took part in World War I. A pacifist at that time, he wrote two collections of verses depicting the horrors and the futility of war, "The Old Huntsman" (1917) and "Counter Attack" (1918). His other books include the prose works, "Memoirs of a Fox-Hunting Man" (1928), "Memoirs of an Infantry Officer" (1930), "Sherston's Progress" (1936), and "Siegfried's Journey, 1916-20" (1946), all of them autobiographical. His other collections of verse include "The Heart's Journey" (1928), "Vigils" (1935), and "Rhymed Ruminations" (1940).

Satan (*sā′tan*). See *Devil.*

Satellite (*săt′ĕl-īt*), a celestial body attending upon and revolving around some planet. The time required for the revolution of a satellite around its planet is called a *period;* the earth's satellite, the moon, has a period of slightly over 27 days, which is the basis for the lunar (moon) month. Like the moon, all satellites shine by reflected sunlight and give rise to eclipses on their respective planets. No satellites are known to the inner planets, Mercury and Venus. On the other hand, Jupiter, the largest planet, has as many as 11 known ones; aside from the four bright ones, which were seen by Galileo, there are seven faint ones which can be observed only with large telescopes. Other planets have fewer satellites as indicated in the following table. Most of the satellites are so small that their gravitational attraction is too weak to maintain an atmosphere.

NAMES OF PRINCIPAL SATELLITES	PLANET	YEAR OF DISCOVERY	DIAMETER IN MILES	PERIOD IN DAYS
Moon	Earth	....	2160	27.32
Phobos	Mars	1877	9?	0.32
Deimos	Mars	1877	5?	1.26
Nameless	Jupiter	1892	100?	0.50
Io	Jupiter	1610	2320	1.77
Europa	Jupiter	1610	1960	3.55
Ganymede	Jupiter	1610	3200	7.15
Callisto	Jupiter	1610	3210	16.69
Mimas	Saturn	1789	300?	0.94
Enceladus	Saturn	1789	300?	1.37
Tethys	Saturn	1684	700?	1.89
Dione	Saturn	1684	700?	2.74
Rhea	Saturn	1672	1000?	4.52
Titan	Saturn	1655	2610	15.95
Hyperion	Saturn	1848	250?	21.28
Iapetus	Saturn	1671	900?	79.37
Phoebe	Saturn	1898	200?	550.44
Ariel	Uranus	1851	300?	2.52
Umbriel	Uranus	1851	250?	4.14
Titania	Uranus	1787	600?	8.71
Oberon	Uranus	1787	500?	13.46
Triton	Neptune	1846	3000	5.88

For man-made satellites, see *Earth Satellite.*

Satellite States, a term borrowed from astronomy and used in politics to indicate those countries which follow the course of a more powerful nation, *e.g.,* Russian Satellites (*q.v.*).

Satin (*săt′ĭn*), a silk fabric of a close texture, made with an overshot woof and a glossy surface. The warp forms a close, smooth surface. In order to impart a luster, the fabric is passed between heated cylinders. An interval of 15 threads occurs in a full satin twill.

Satinwood (*săt′ĭn-wo͝od*), an ornamental wood obtained in the West and East Indies. Satinwood, one of the most highly prized light woods for cabinetwork, has a close grain and is hard and durable. Several species of trees yield satinwood. The finest products are secured in the West Indies and are from the prickly ash, called *Bahama satinwood.* In India it is used for building purposes, especially for floors in dwellings.

Satire (*săt′īr*), the use of sarcasm, irony, or wit in attacking individuals, manners, or social and political movements. Criticism is a necessary element of satire; the Greeks were the first to employ it in holding wickedness, folly, vice, and excessive pride up to public ridicule and censure. Aesop, with his "Animal Fables," definitively mirrored universal human foibles in such fables as "The Fox and the Sour Grapes" and "The Town Mouse and the Country Mouse." Aristophanes, the Greek playwright, perfected stage satire in "The Frogs" and "The Clouds." Horace, Ovid, Juvenal, and Lucian were Roman poets who brought polish and finesse to satire. During the 16th-century French Renaissance, François Rabelais created a monumental satire of the contemporary scene with his "Gargantua and Pantagruel." Cervantes' "Don Quixote" and Molière's dramas are other important satires. The greatest English satirists were John Dryden, Alexander Pope, and Jonathan Swift (*qq.v.*). Swift's "Gulliver's Travels" is the high point of literary satire. Lichtenberg, Grimmelshausen, and Heinrich Heine were the leading German satirists. American satire is represented by James Russell Lowell's political verses, Mark Twain's caustic allegories, Sinclair Lewis's social satires (*e.g.,* "Babbitt"), Thomas Wolfe's violent literary caricatures, and James Thurber's sophisticated stories. Satire is often closely allied to parody (*q.v.*), humor, and irony.

Satrap (*sā′trăp*), the governor of a satrapy (province) in the ancient empire of Persia (*q.v.*). Appointed by the king, the satrap was virtually a vice-regent and had wide powers. He commanded the provincial troops, although he had no command over imperial soldiers, and for a time had the right to issue his own coinage. The fundamental outline for the functions of the satraps was set up by Darius I (*q.v.*). Alexander the Great (*q.v.*), in the interest of consolidating his control over Persia, greatly reduced the power of the satraps.

Saturation (*săt-ū-rā′shŭn*), in physical chemistry, a term indicating maximum concentration of a solution or vapor at a given temperature or pressure, *e.g.,* a saturated solution of salt is one that can dissolve no more salt. In organic chemistry, saturation denotes the condition in which the carbon to carbon linkage is single bonded. A double or triple bond is unsaturated, *i.e.,* can continue to absorb hydrogen or halogens. Ethylene and acetylene derivatives are unsaturated; the methane series of hydrocarbons is saturated.

Saturation Current (*săt-ū-rā′shŭn kûr′ęnt*), the maximum possible ionization current, thermionic current, or photoelectric current that can be obtained as voltage is increased in an electronic tube. It occurs when ions or electrons are being carried off as fast as they are released by collision, heat, or light. See also *Electron; Electronics.*

Saturation Pressure (*săt-ū-rā′shŭn prĕsh′ẽr*), the pressure of a saturated vapor at a given temperature. A saturated vapor is one which is in equilibrium with the liquid phase of the same substance. At this condition the interchange of molecules between liquid and vapor is balanced so that just as many go from liquid to the vapor as return from vapor to the liquid. The saturation pressure increases very rapidly with the temperature of the liquid.

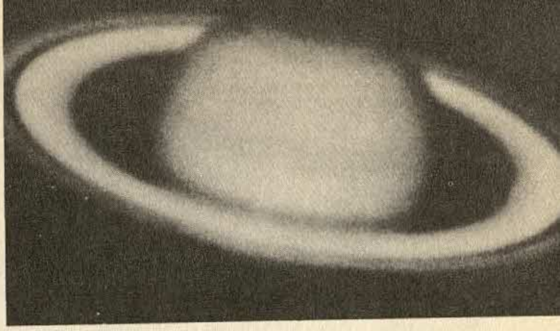
Saturday (*săt′ẽr-dĭ*), the seventh and last day of the week, so named from Saturn. It is the Sabbath of the Jews and several Christian denominations, including the Seventh Day Adventists and the Seventh Day Baptists.

Saturn (*săt′ûrn*), a deity of ancient Italy. He is identical with the Greek Cronus, the god of time in its sense of eternal duration, and of agriculture. He is represented as having married Rhea, daughter of Uranus and Gaea. His uneasy conscience made him fear that his children might some day rise up against his authority, as he himself had done in the case of his father, and, in order to render the prophecy impossible of fulfillment, he swallowed each child as it was born, greatly to the sorrow and indignation of his wife, Rhea. She resolved to save the sixth and last child, who was none other than Zeus, and did so by placing a stone in baby clothes, which Saturn swallowed in his eager haste without noticing the deception. The child was nourished, protected, and educated in Crete, and the stone which had counterfeited him was placed at Delphi, where it was long exhibited as a sacred relic.

When Zeus reached manhood he made war against Saturn and the Titans, and at length deprived his father of supreme power. The career of Saturn as a ruling Greek divinity ceases with his defeat, but like other gods he was supposed to be still in existence, and is by some writers connected with the government of Italy in the time of Janus, sharing sovereignty with the latter. The myth of Saturn swallowing his children is evidently intended by the poets to express the melancholy truth that time destroys all things. The reign of Janus and Saturn was so thoroughly peaceful and happy that it became known as the Golden Age. He was represented bearing a sickle in one hand and a wheat sheaf in the other. A temple was erected to him at the foot of the Capitoline Hill, in which were deposited the public treasures and laws of the state.

Saturn, the second largest planet and the sixth in distance from the sun. It has a mean diameter of 71,000 m. or nine times that of the earth. The most remote planet known to the ancients, it shines with a pale yellow light and to the eye appears as a star of the first magnitude. The surface shows a banded structure on which definite markings appear occasionally, a circumstance which has made it possible to ascertain that the planet turns around its axis in a little over 10 hours, faster at the equator than near the poles, suggesting that what is observed is not a solid surface but belts in a dense atmosphere. The rapid rotation accounts for a marked oblateness; the diameter at the pole is about 68,000 m. against 74,000 at the equator.

It takes the planet 29.46 years to make a complete revolution around the sun, from which it is 9.5 times more distant than the earth. It has the lowest density known among the planets, hardly three-quarters that of water.


SATURN AND ITS RINGS

The most unique characteristic of this planet is its ring, which puzzled Galileo in 1610 and whose phases were explained by Huygens in 1655. The ring consists of three concentric sections separated by narrow gaps. The inner ring is sometimes called the "crepe-ring," because it is semi-transparent. The ring is thought to consist of a multitude of small solid particles moving like that many tiny satellites around the planet. Aside from the ring the planet is attended by nine satellites (*q.v.*).

Saturnalia (*săt-ûr-nā′lĭ-ȧ*), a national festival of the Romans in honor of Saturn, celebrated after the gathering of the harvest, usually from Dec. 17 to 23. It was a time of universal cessation from labor, rejoicing, and merrymaking. No business was transacted, the courts were closed, friends sent presents to each other, and school children were given a holiday. Crowds of people flocked to Rome from the surrounding country. All classes partook of the general exultation, giving themselves over to enjoyment, practical jokes, and general rejoicing. Social distinctions were for a time suspended, or even reversed. The Romans entered so heartily into the spirit of this festival that masters waited upon their slaves, the latter being dressed on these occasions in the garments of their superiors.

Satyrs (*să′tẽrz*), in Greek legends, a race of woodland sprites, who personified the free life of the forest. They were generally represented as half human and half animal, the upper part being that of a human being and the lower that of an animal. Their appearance was both grotesque and repulsive, but their life was one of pleasure and self-indulgence, mostly given to the chase and wild music. At intervals they partook of wine and indulged in restful slumber. Both mortals and the gentle woodland nymphs dreaded them, mostly because of their reckless sports. They were represented in the train of Dionysius and were inseparably connected with his worship. Greek poets delighted to praise the innocent frolics of the little satyrs, and sculptors represented the older forms as nearly approaching human beings, but placed horns upon their heads and gave them the feet and legs of goats. The Satyr of Praxiteles at Athens is a famous speci-

SATYR AND CHILD
Engraving by Marcantonio Raimondi (1475-1534)

men of Greek sculpture. Pliny used the word to indicate a kind of ape.

Saudi Arabia (*sou'dĭ ȧ-rä'bĭ-ȧ*), a kingdom of the Arabian peninsula, comprising the sultanate of Nejd, the kingdom of Hejaz, and two dependencies. It is bounded on the N. by Hashemite Jordan and Iraq; on the E. by Kuwait, Qatar, Trucial Oman, Oman, and the Persian Gulf; on the S. by Dhofar, Hadramaut, and Aden; and on the W. by the Red Sea and Yemen. Its area is 927,000 sq. m. The two capitals are Mecca (pop. 120,000) and Riyadh (pop. 150,000). Jedda (pop. 20,000) is the chief port. The chief products are dates, wheat, barley, fruit, hides, wool, Arab cloaks. Camels, horses, donkeys, and sheep are raised. Some hides, wool, and gum are exported. American and other oil companies exploit the large oil reserves of the country, the chief field being at Dhahran near the Persian Gulf. Gold is mined between Mecca and Medina, but mining is not a major enterprise. Buses are the chief means of transportation. Mecca, the birthplace of Mohammed, and Medina, the site of his tomb, attract over 150,000 pilgrims annually from all parts of the Moslem world. The first ruler, Abdul-Aziz ibn Abdur-Rahman Al-Faisal Al Sa'ud (1880-1953), known as Ibn Saud, united by conquest his sultanate of the Nejd with the kingdom of the Hejaz on Jan. 8, 1926. A constitution for Hejaz alone, issued in 1926 and since amended provides for a council of ministers, a consultative legislative assembly at Mecca, municipal councils at Medina and Jedda, and village or tribal councils elsewhere. The law of Islam prevails as the law of the land. The monetary unit is the riyal. The kingdom has an army of *ca.* 40,000 and a small air force. About 939 m. of roads are suitable for motor transportation. A railroad linking Riyadh and the oil fields on the Persian Gulf was completed in 1951. There are *ca.* 125 grammar and high schools and a two-year college course.

1957 MEETING ON THE MIDDLE EAST
King Saud and President Eisenhower in Washington

In World War II, Saudi Arabia declared war on Germany and Japan, March 1, 1945, and in April joined the U.N. Saudi Arabia opposed the U.N. decision to create a Jewish state in Palestine and lent financial aid to other members of the Arab League (*q.v.*) in the war against Israel (*q.v.*). Upon the death of Ibn Saud, Nov. 9, 1953, his eldest son ascended the throne as King Saud; the new king's younger brother Faisal, the foreign minister, became crown prince. Population, about 5,250,000. See also *Arabia.*

Sauerkraut (*sour'krout*), an article of food prepared from cabbage. The cabbage is gathered when the heart is firm, cut into shreds, and packed with salt in a cask or barrel, where it is allowed to ferment under pressure. The addition of condiments improves the taste.

Saugus (*sa̤'gŭs*), a town in Essex County, Massachusetts, 8 m. N. of Boston. It is on the Saugus river and the Boston & Maine R.R., and is a residential suburb of Boston. One of its attractions is the Old Ironworks House (1645) for which timber was brought from England. Woolen goods, brick, shoes, spices, and machinery are among the manufactures. Saugus was incorporated in 1815. Population, 1940, 14,825; 1950, 17,162.

Saul (*sạl*), the first king of Israel, son of Kish of the tribe of Benjamin, fl. *ca.* 1025 B.C. Saul was anointed king by Samuel in response to the people's demand for a king. His reign was largely occupied by warfare against the Philistines, Amalekites, and other Gentile tribes. The dramatic and moving story of Saul, as told in the Bible (I Samuel: 9-31), is also the story of the rise of David (*q.v.*) from musician, to rival, to successor of the king. It tells of Saul's brooding jealousy of David, of the unswerving friendship between David and Saul's son Jonathan, and of Saul's consultation with Samuel's ghost in the cave of the Witch of Endor. Saul was killed in battle with the Philistines on Mt. Gilboa. His story was the basis for an oratorio by Handel and a long dramatic poem by Robert Browning.

Sault Sainte Marie (*so͞o sânt mȧ-rē′*), a port city and county seat of Chippewa County, Michigan, at the rapids of the St. Mary's River, between Lake Superior and Lake Huron (in the Upper Peninsula of the state). Sault Sainte Marie is the twin city of a city of the same name in Ontario Province, Canada, with which it is connected by a ferry and a railroad bridge, and it is served by the Duluth, South Shore & Atlantic, the Canadian Pacific, and other railroads. In 1855 the Sault Sainte Marie Canal and lock was opened, linking Lakes Superior and Huron on the American side of the rapids. Additional locks built since then, brought about a great increase in shipping. Sault Sainte Marie has manufactures of carbide, leather, woolen goods, lumber, and dairy products. The region on both sides of the rapids is called "the Soo." A mission was established here (1641) by the Jesuits, who named it Sault Sainte Marie, but the first permanent settlement was not made before 1668. Fort Brady, built (1823) after the negotiation of an Indian treaty and rebuilt in 1893, was in use until World War II. Population, 1950, 17,912.

Sault Sainte Marie, a city of Algoma district in southern Ontario, Canada, on the north shore of the St. Mary's River, opposite Sault Sainte Marie, Mich. The Canadian city is an important port and rail center, with steel mills, ore docks, foundries, lumber, pulp, and paper mills, railroad shops, breweries, smelters, and chemical works. It is a tourist center and gateway to the many hunting and fishing resorts in the nearby forests and lakes. Founded in 1887, it was incorporated in 1912. Population, 1951, 32,452.

Sault Sainte Marie Canals or SOO CANALS, two waterways, in Michigan and in Ontario, Canada, extending around the rapids of the St. Mary's River and connecting Lake Superior with Lake Huron. By means of a series of locks they raise and lower vessels from one level to another (16½ to 20½ ft.). The first U.S. canal was built (1853-55) by the State of Michigan. The Weitzel Lock, an improvement in the original canal, was finished in 1881, and in the same year the Federal government took over control of the locks. Fifteen years later the government added the Poe Lock to meet the demands of increased navigation, later two more locks were built, the Davis and Sabin; in 1943 the MacArthur Lock, which is smaller than the last-named locks, was added. The U.S. canal is 1⅗ m. long, has a minimum width of 216 ft., and is 25 ft. deep. The Canadian canal (built 1885-95) has a single lock and is 1⅓ m. long, 150 ft. wide, and 22 ft. deep.

Saumur (*sō-mür′*), a town of western France, in the department of Maine-et-Loire, on the Loire River about 27 m. S.E. of Angers. Its sparkling white wines are famous, and there are manufactures of jewelry, machinery, and foodstuffs. The site of Saumur was inhabited by the Romans. The town was a stronghold of the Huguenots in the 16th and 17th centuries. The town suffered some damage during World War II. Population, 1946, 17,635.

Saurians (*sạ′rĭ-ạnz*), a general term for fossil reptiles.

Saury Pike (*sạ′rȳ pīk*), a salt-water fish belonging to the flying fishes, peculiar for its greatly prolonged body. It is covered with minute scales, has long jaws resembling a beak, and swims very near the surface, often leaping out of the water and gliding through the air for some distance. This habit, adopted by the fish to escape the attacks of larger fish and tortoises, has given it the name of *skipper* or *skipjack*. Several species are native to American and European waters. The American saury pike is remarkable for its long, thin body. All species are edible.

Sausage (*sạ′sĭj*), a processed food, consisting of finely chopped meat mixed with seasonings and other ingredients. It is one of the oldest forms of processed food known to man; sausage is mentioned in Homer's "Odyssey," and there are frequent references to various kinds of sausage in ancient Roman literature. There are more than 100 known varieties of sausage, many of which take their names from the places in which they originated. Such sausages include the frankfurter (from Frankfurt, Germany), the bologna (from Bologna, Italy), and the wienerwurst (from Vienna, Austria). The common pork sausage of the U.S. is made with pork, potato flour, water, and seasonings. Most sausage meat is packed in casings made of the cleaned intestines of the butchered animals or in cellulose casings.

Sauternes (*sō-tẽrn′*), a village of western France, located in the department of Gironde,

Courtesy Chamber of Commerce, Savannah, Ga.

WATERFRONT OF SAVANNAH, GEORGIA

with a population of about 850. It is famous for its vineyards which yield the white, naturally sweet wines known as *sauterne*. One of the outstanding wine-producing estates of the Sauternes district is Château Yquem whose wines are noted for their rich bouquet and freshness. Sauterne is not dry as are all other Bordeaux wines.

Sava (*sä'vä*) or SAVE, a river in northwestern Yugoslavia, rising in Carniola, near the boundary of Italy. After a course of 550 m. toward the southeast, it joins the Danube near Belgrade. It separates Carniola from Styria, crosses Croatia, and separates Slavonia from Bosnia and Serbia. The valley of the Sava is highly fertile, producing large quantities of cereals and fruits. Among the principal tributaries are the Una, Drina, Bosna, and Kulpa Rivers. It is navigable for 335 m.

Savage (*săv'ij*), JOHN LUCIAN, engineer, born Dec. 25, 1879, in Cooksville, Wis. He was graduated in engineering from the Univ. of Wisconsin and in 1903 became an engineer for the U.S. Reclamation Service in Idaho. From 1908 to 1916 he abandoned government service to be a private construction engineer, but in the latter year he returned to the Bureau of Reclamation. He was a designing engineer in charge of civil engineering design until 1924, when he became chief designing engineer in charge of all designing for the bureau. Major projects which he has designed and of which he has supervised the construction include some of the largest and most efficient dams and power projects in the world, *e.g.* the Grand Coulee Dam and power plant in Washington, Boulder Dam and power plant in Arizona and Nevada, and Norris Dam and power plant for the Tennessee Valley Authority in Tennessee. In 1950 he was named to the 11-man Advisory Board on International Development (planning group for the American Point Four program).

Savage, RICHARD, poet, born in London, England, Jan. 10, 1698; died July 31, 1743. He claimed that he was an illegitimate son of Richard Savage, Lord Rivers, and the Countess of Macclesfield, although his claim was never proven. He studied at the grammar school of St. Albans and afterward was apprenticed to a shoemaker in Holborn, but soon turned his attention to literature. Although failing to become poet laureate after an earnest effort, he received a pension from Queen Caroline. His best known writings include the poems entitled "The Bastard" and "The Wanderer"; "Love in a Veil" and "Woman's a Riddle," two well-known comedies; and the tragedy "Sir Thomas Overbury." He moved in the circles of Dr. Johnson, who treated him favorably in his "Lives of the Poets."

Savannah (*să-văn'ă*), a river of the U.S., formed by the meeting of the Tugaloo and the Seneca Rivers; it rises near the northwestern boundary of South Carolina and, after a general course toward the southeast, flows into the Atlantic Ocean. It forms the boundary between South Carolina and Georgia, is 450 m. long, and is navigable for large vessels to the city of Savannah, 18 m. from the sea, and for small steamboats to Augusta.

Savannah, a city in Georgia, seat of Chatham County, on the Savannah River, 18 m. from the Atlantic Ocean, with facilities to accommodate ocean-going vessels. It is the oldest and second-largest city in the state and an important port of entry. It is served by the Atlantic Coast Line R.R., the Seaboard Air Line R.R., the Southern Ry., and the Central of Georgia Ry. Hunter Air Force Base is located here, and Travis Field, a commercial airport, is 10 m. N. of the center of town. Laid out from a design by William Bull and James Edward Oglethorpe (*q.v.*), Savannah has an area of 14.6 sq. m.; its many squares contain monuments to such notable persons as Count Casimir Pulaski, Nathanael Greene, and William Jasper (*qq.v.*). Forsyth Park, occupying 10 acres in the center of the city, has a parade ground and a Confederate monument.

Located in a fertile region which produces fruits, sugar cane, and vegetables, Savannah has an extensive coastwise and foreign trade and is a cotton-shipping port. Among its industries are the production of lumber, millwork, fabricated metals, transportation equipment, foods, chemicals, fertilizers, petroleum products, and paper. Savannah is the center of the Savannah

Standard Metropolitan Statistical Area (pop., 1960, 188,299), which includes all of Chatham County. The city of Savannah alone produced a value added by manufacture of $31,552,000 in 1958.

The city is the seat of Armstrong Coll. of Savannah and Savannah State Coll. Historic sites include the Savannah Theater (1818), and the "Hermitage" (1783), 5 m. to the north, a survival of the 19th-century Southern plantation. Among the private homes are fine examples of pre-Civil War architecture.

Savannah was founded in 1733 by James E. Oglethorpe. Capital of the Georgia colony, it was captured by the British in 1778 and held until the end of the Revolutionary War. It was the state capital, 1782-85, and in 1789 was incorporated as a city. The *Savannah,* a sailing ship which was the first to use auxiliary steam engines in an Atlantic crossing (1819), was owned by residents of the city. (The first nuclear-powered U.S. cargo vessel, named the *Savannah* for its pioneering predecessor, was launched in 1959.) General W. T. Sherman (*q.v.*) captured Savannah in 1864, thus completing his march to the sea. Much of the city was destroyed, but it was rapidly rebuilt. Savannah is now one of the leading commercial cities of the South and, with its mild climate, a popular resort.

The population of Savannah in 1890 was 43,189. Its decade of greatest growth was 1940-50, when the population increased from 95,996 to 119,638, an increase of 28.4 per cent. In 1960 the population was 149,245.

Savings and Loan Association (*săv′ingz and lōn ȧ-sō-sĭ-ā′shŭn*), a type of financial institution designed to encourage thrift as well as to facilitate home ownership. The first association in the U.S. was founded in Frankford, Pa., in 1831, and was modeled on the "building societies" which operated in England much before that time. The movement developed and spread, aiding countless families to own their own homes through loans from the associations. In 1959 there were *ca.* 6,200 such associations, both state and federally chartered, with assets of *ca.* $63,000,000,000. The capital of the associations is derived from savings deposits made by the public and reserves from earnings. Their facilities are supplemented by the Federal Home Loan Bank System, through which they may obtain short- and long-term loans.

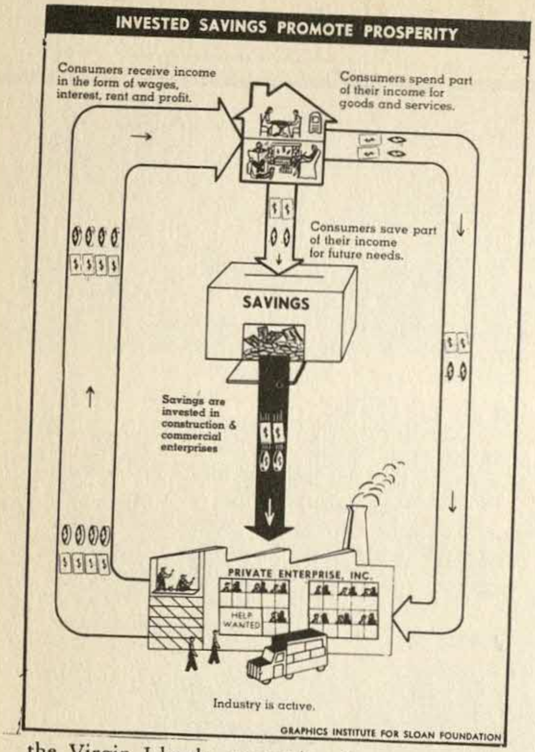
The Home Loan Bank Board was authorized by the Home Owners' Loan Act of 1933 to charter, regulate, and examine Federal savings and loan associations. The purpose of the authorization was to provide additional local and mutual thrift institutions in which people may invest their funds, which are used for the financing of homes. The Federal associations differ from banks in that they are not permitted to accept deposits. As is the case with a large proportion of U.S. banks, individual investors' accounts in some 2,900 associations are insured, up to $10,000, by the government through the Federal Savings and Loan Insurance Corporation (*q.v.*). See also *Savings Bank.*

Savings Bank (*săv′ingz băngk*), a specialized banking institution for receiving, safeguarding, and investing small deposits of money. The primary object of savings banks is to inculcate the thrift habit and to encourage the accumulation of earnings among people in all income brackets. These banks pay interest upon deposits at stated intervals, such interest depending upon the rate of earnings accruing from the bank's investments.

In classifying savings banks, two broad categories may be mentioned: *public,* and *private.* Under the group of public savings banks belong the *postal savings* and the *municipal savings* systems. Private savings institutions include *mutual savings banks, stock savings banks, benevolent savings societies,* etc. Savings banks offer to depositors regular accounts and special accounts (Christmas Club, war bonds, taxes); they also accept group or club deposits. Although a minimum deposit may be required before interest is paid on an account, only nominal amounts are required to begin savings accounts.

The history of savings banks dates from an idea conceived by Daniel Defoe in 1697; however, it was not until the late 18th century in Europe that savings banks became widespread. Largely a philanthropic movement at that time, savings banks on the continent were located at Brumath, France; Hamburg, Germany; Berne, Switzerland. The first large British institution of this kind was founded in London, England, in 1798. The earliest savings banks in the U.S. were mutual corporations of the benevolent type, based on the principle of the first mutual or trustee savings bank established in Ruthwell Village, Scotland (1810), by the Rev. Henry Duncan for the purpose of alleviating the financial ills of his impoverished congregation. In 1816 the Provident Institution for Savings in the Town of Boston, as well as the Philadelphia Saving Fund Society, started the movement in America for mutual or community savings institutions. By 1820, 10 such banks existed, with over 8,500 depositors and more than $1,000,000 in deposits. As the movement spread, new institutions attracted special groups of citizens; hence, some savings banks bear such names as "Artisans," "Seamen's," and "Farmers and Mechanics" in their titles. Others, in incorporating terms like "Dime" and "Dollar" in their names, indicate that the founders considered no sum too small to be saved.

Mutual Savings Banks. In the U.S., mutual savings banks operate in 17 of the 50 states and


INVESTED SAVINGS PROMOTE PROSPERITY

Consumers receive income in the form of wages, interest, rent and profit.
Consumers spend part of their income for goods and services.
Consumers save part of their income for future needs.
SAVINGS
Savings are invested in construction & commercial enterprises
PRIVATE ENTERPRISE, INC.
HELP WANTED
Industry is active.

GRAPHICS INSTITUTE FOR SLOAN FOUNDATION

the Virgin Islands, accounting for *ca.* one-third of all U.S. bank deposits. Total mutual savings deposits as of Dec. 30, 1959, aggregated $35,000,000,000, owned by 22,100,000 depositors. The average amount in each mutual account, including special ones (*i.e.,* Christmas Club, vacation savings, tax accounts, etc.) is *ca.* $1,500. These banks are strictly controlled by law, with a view to protecting the depositors' funds. The savings bank, unlike banks of discount or commercial banks, has no capital stock, does not return profits to stockholders, and is not a business corporation. Instead, the depositors share in any profits. While savings banks may vary as to organization, management, types of accounts, etc., they are all subject to government regulations. Considered benevolent institutions, they exist to serve the needs of small depositors. Most mutual savings banks insure their accounts up to $10,000 with the Federal Deposit Insurance Corp., or, under a similar arrangement, with state insurance deposit funds. Furthermore, specific requirements are laid down by the various states with reference to savings bank incorporation, management, investments reports, limit of accounts, etc.

Mutual savings banks are managed by a board of trustees, governors, or directors, who receive no profit, except as salaried executives, from the earnings of the institution. Trustees, working for the benefit of the depositors, constitute a representative group of every community; the board is generally a self perpetuating body, choosing new members to fill vacancies, but in a few states trustees are elected by a board of corporators. Various requirements prevail as to the business and moral record of trustees.

Like other banks, mutual savings banks have increased their services from time to time. Some state laws permit branch offices, thus widening the scope of the bank. Other services have included the installation of safe-deposit vaults for public rental, banking by mail, mechanical night depositories, free counsel, school savings systems, special accounts, and life insurance. The latter was introduced as mutual savings bank life insurance in Massachusetts in 1908, an outgrowth of the ideas of the late Justice Louis D. Brandeis (*q.v.*) of the U.S. Supreme Court. New York and Connecticut also have made such insurance, generally cheaper than the customary commercial insurance, available to the public. Such has been the success of insurance plans that savings-bank life insurance has become an integral part of the mutual savings system.

Another type of savings institution, important especially in the South and West, is the ***stock savings bank***. It offers a commercial motive by operating as a corporation with stocks and stockholders. The earnings are divided between these shareholders and the depositors. Managed by boards of directors chosen by the stockholders, the stock savings bank, often called "Savings Bank and Trust Company," is organized chiefly to make profit for the owners. In certain states these banks are exclusively savings institutions, operating under special laws; in others, they are under the general banking laws and serve as commercial banks with a savings department.

Implanting the idea of thrift and individual depositing at an early age, the ***school savings bank*** has spread throughout the U.S. Each week pupils' savings, no matter how small, are recorded by the teacher in individual pass books, and ultimately deposited in a local bank.

Since 1910 the ***postal savings system*** has maintained depository offices for accounts as low as $1.00. Unlike the private banks mentioned above, the postal savings bank is Federally operated and backed by the credit of the Federal government. The system has proved itself to be self-supporting.

Savings deposits in all banks have grown steadily in recent years. On Dec. 30, 1959, savings deposits in all private banks in the U.S. totaled $100,400,000,000. (See also figures under MUTUAL SAVINGS BANKS, *above.*) See *Bank and Banking; Postal Savings; Savings and Loan Association.*

Savonarola (*sä-vô-nä-rō'lä*), GIROLAMO, reformer and statesman, born at Ferrara, Italy, Sept. 21, 1452; died May 23, 1498. He was descended from a noble family, received early instruction at home, and, in 1474, was sent to Bologna, where he entered the Dominican order. After studying Greek philosophy and theology, he was sent to the Convent of San Marco at Florence and began to preach there in 1482. Although spiritually strong, he possessed a harsh and unpleasant voice, which caused his lectures to be poorly attended. He was then sent to the convent at Brescia, where he overcame his former defects and attained such fame as a preacher and theologian that he was recalled to Florence in 1490 by Lorenzo de' Medici. Through the latter's influence, Savonarola became prior of San Marco, the famous monastery for which Fra Angelico (1387-1455) had painted his wonderful murals. Now, however, under Savonarola, San Marco became the center of a religious drive against all arts.

Savonarola was a teacher and a writer, but most especially a preacher. In his sermons, which reached a tremendous audience of the politically aroused Florentines, he combined the urge for a more intense and more honest Christian life, exemplified by deeds of charity and faith, with an active fight against all error and corruption in politics and government. He fought for the liberty of all peoples as granted by divine law. However, he combined these ethical and religious exhortations with the condemnation of all art and higher culture, which he considered pagan. Thus he undermined the highest glory of Florence, those endeavors which had made it the birthplace of the Italian Renaissance.

The impact of Savonarola's sermons was heightened by the fact that he had announced the invasion of Italy by the French under Charles VIII in advance of the actual occurrence. Since he objected to the aristocratic government of Florence under the Medici family, he actually welcomed the arrival of the French, who expelled the Medici in 1494. He built up a new theocratic-political government, which tried to fuse government by the people with government by the Church. It was definitely democratic and antiaristocratic, but it was also directed against all higher values of secular culture, as well as against extravagance and immorality. Actually, his endeavors soon turned from a general improvement of morals into an iconoclastic fury against works of art and literature, and he was responsible for the burning of copies of Boccaccio's works and the destruction of other Renaissance masterpieces.

Savonarola reformed not only the moral habits of the populace, but also the Dominican order, of which the Pope had made him vicar-general in 1493. His crusading even touched upon the higher hierarchy of the Church by organizing a reform movement against the papal court in Rome which sought to purge the clergy of all unworthy elements.

The natural instincts of the Italian people, especially of the Florentines, soon caused them, however, to turn against him. The Pope himself felt endangered by him, and finally Pope Alexander VI excommunicated him by a bull which was read in Florence Cathedral in 1497. A Franciscan friar, Francesco di Pugli, denounced him, and Savonarola was almost murdered on the pulpit. Church and government united against him, especially when he began, after a brief retreat, to preach again in 1498. In spite of the endeavors of the Dominicans against intrigues of the Franciscan monks, people gradually began to turn away from him. A proposed ordeal by fire to prove his divine mission was not carried out, and he withdrew into his monastery of San Marco. The mob stormed the monastery, forced him out, and put him to trial. Meanwhile, the government of Florence had passed again into the hands of the aristocrats, and Savonarola, deserted also by the papal faction, was tortured and finally condemned to die as a heretic. With two other Dominicans, he was hanged and publicly burned.

His numerous writings prove that he actually was not a heretic and did not fight against any doctrines of the Church, with the exception of the infallibility of the Pope, which then was not yet a dogma. He must be regarded as an honest and pure reformer with the best intentions, but one whose zeal unfortunately made him unable to distinguish between licentiousness and those secular works of art which represented the greatest value of the Italian Renaissance.

Savoy (*sȧ-voi′*), HOUSE OF, the name of the most recent royal family of Italy. The name of Savoy may be traced back to the year A.D. 407, when the small territory of Savoy was seized by the Burgundians from Rome. Emperor Henry V bestowed the title of Count of Savoy on Amadeus III in 1111, and Emperor Sigismond, in 1416, made Amadeus VIII the first Duke of Savoy. From 1485 the dukes of Savoy claimed to be kings of Cyprus and Jerusalem, but the title of king was not generally recognized until the Treaty of Utrecht was concluded in 1713. That

EXECUTION OF SAVONAROLA

treaty ended the War of the Spanish Succession and gave to Victor Amadeus II, Duke of Savoy, the island of Sicily and a part of the duchy of Milan, and conferred upon him the title of king. He was compelled to surrender Sicily to Austria in 1720, but received in exchange the island of Sardinia, which, along with his other possessions was designated the kingdom of Sardinia. On May 9, 1946, King Victor Emmanuel III, who had ruled Italy since July 29, 1900, abdicated in an attempt to preserve the House of Savoy. His place was taken by his son who became King Humbert III. Humbert was unseated by the referendum held on June 2-3, 1946, and left the country on June 13, after ruling for only 35 days. As a result of the election a republic replaced the monarchy. See also *Italy.*

Saw (*sa̧*), a tool with a toothed edge, made of tempered steel, used for cutting wood, metal, or other hard substances. One of the earliest known tools, the saw has been in use since the dawn of history. The ancient Egyptians developed saws which cut on the draw stroke (as contemporary Turkish and Japanese saws still do), and used bronze saws with jeweled teeth for cutting the hardest stones. Hand saws of essentially modern form were employed in London as early as 1702, but it was many years (1874) before the development of the present-day true, taper-ground, streamlined saw. The circular saw, first developed about 1790 in England and pounded out on an anvil by a local blacksmith, did not become an article of commerce until 1810. Saws are made in many sizes and shapes. The smallest include those designed for surgical and dental operations; others range upward to the great saws required for cutting the largest timber. They are divided into three general classes: (1) *reciprocating,* (2) *revolving,* and (3) *traveling.*

Reciprocating saws cut on either the forward or backward stroke, or both. *Hand saws* are in this class, including all those used by carpenters, cabinet-makers, and other woodworkers. These saws are divided into two types according to the angle at which the teeth are set, one type suitable for *crosscutting* (sawing across the grain of the wood), the other for *ripping* (sawing with the grain). These hand saws must be of uniform thickness on the tooth edge, and in order to give steadiness and strength to the blade they must be ground so that they taper in thickness from tooth-edge to back as well as on the back from point to handle. Hand saws vary as to length and size of teeth. Selection of teeth is important—fine teeth for sawing hard, dry wood, coarse for soft, green wood. Saws of the reciprocating type which operate in machines include power hack-saws, gang saws, scroll or jig saws, etc.

Revolving saws cut in one continuous direction, and the name covers every type of *circular saw.* These saws are usually power operated. A *circular saw* consists of a disk, with teeth in its periphery, mounted upon an arbor with which it rotates, usually at high speed. These saws are used for cutting large logs in sawmills. Other uses are for cutting across blocks of wood and cutting cordwood into fire lengths. Circular saws are made with several different kinds of cutting edge, including: (1) teeth indented in the periphery; (2) removable teeth, inserted, and held in by means of wedges, or "holders"; (3) diamonds imbedded in the periphery for cutting stone; (4) without teeth, or with notches in the periphery, operated at high speed for cutting metals by means of friction.

The *traveling saw,* known as the *band saw,* is in the form of a continuous belt running over wheels. It is made by cutting teeth in one edge of an endless strip of steel; its thickness and width depend upon the saw's purpose. Some of these saws, designed to cut the largest logs, are made as wide as 16 in., and may have teeth on both edges in order to cut on both passages of the log through the machine. Band saws are also made as narrow as ⅜ in. and tempered for cutting the most intricate metal objects. A wider and heavier type is used to cut and trim phosphor-bronze castings. The recent development of the *power chain saw* has greatly lessened the labor of lumbering and construction work.

The saw is an essential element in woodworking, more important to this industry than to any other. Wood saws include hand, circular, band, tenon, compass, keyhole, pruning, jig, and numerous other special types, in addition to crosscut saws (both one-man and two-man) for timber and log sawing. Regularity of temper is essential in a saw. A saw made for cutting wood, or one intended for metal, will give service only when it is used for the purpose intended. Some saws, left low in temper, may be readily resharpened with a triangular section file, while others must be so hard that only an abrasive wheel will do the job. Teeth vary from fine to coarse, according to the class of sawing to be done, and the purpose also regulates the shape and arrangement of the teeth. They may point forward, with edges straight or curved, or have equal angles, or be made in some special shape. Certain saws are made with "cleaner" (or "raker") teeth to carry the sawdust from the *kerf* (channel made by the saw), notably saws used for crosscutting heavy logs and lumber. Clearance, or *kerf,* depends upon the *set,* which is the side projection of the teeth beyond the plane of the blade, or the result of spreading ("swaging") the points of the teeth. The side projection known as *spring-set* is made by bending alternating teeth to the right and left.

Sawmills are large establishments where logs are sawed into lumber by power, usually steam or water. They often include lath and planing machines as well as saws. Sawmills have been in operation for many years, the first one on record having been built in Augsburg, Germany, in 1322. England's earliest sawmill, erected by the Dutch near London (1663), had to be abandoned because of destructive riots staged by hand sawyers against use of such a labor-saving device. In 1634 an American sawmill was built at the Falls of the Piscataqua on the Maine-New Hampshire boundary, but the first steam sawmill was not erected in this country until the 19th century (New Orleans, 1803). All these early mills were of the reciprocating type, and known as *sash* or *gate sawmills,* having the saws trained along a strong rectangular frame driven by a crank on a revolving shaft. Later, several saws added to one *sash* produced the *gang saw*. This was followed by the circular type, and then by the band saw because it was less wasteful than the circular. Today, the sawmills of the U.S. and Canada constitute a vast industry, cutting yearly millions of feet of lumber both for domestic purposes and for export.

Sawfish (*sạ'fish*), a genus of fish bearing resemblance both to the sharks and rays, but distinguished by having a long beak or snout. They attain a length of from 10 to 20 ft. and are among the most savage of fish. The beak is often 6 ft. long, has from 16 to 28 pairs of teeth set horizontally in sockets, and is used to rip or tear open its prey. Sawfish have been known to inflict mortal wounds on whales. Their flesh is too coarse to be eaten. Many species have been enumerated. The common sawfish, native to the Atlantic from New Brunswick to Florida, is the best known.

Sawfly (*sạ'flī*), the popular name of a class of insects that deposit their eggs in holes cut into vegetable tissues. They are so named from the sawlike apparatus with which the females are supplied, which they use in conveying the eggs into these openings. The female deposits one egg in each perforation, together with a peculiar fluid, which gives rise to a small swelling or enlargement to accommodate the larva. Most of the species, of which there are about 2,000, are native to the temperate regions. Some species are very injurious to the leaves and fruit of cultivated trees, while others are pests to wheat, barley, grapes, and other plants. Others attack rose and currant bushes and pear trees.

Saxe (*săķs*), JOHN GODFREY, poet, born in Highgate, Vt., June 2, 1816; died Mar. 31, 1887. After being graduated from Middlebury Coll. in 1839, he studied law at St. Albans, Vt., where he was admitted to the bar in 1843. He established a successful practice in Franklin County, and was a superintendent of schools for two years. From 1850 to 1856 he edited the Burlington *Sentinel,* and in 1859 and 1860 ran unsuccessfully as a Democrat for governor of Vermont. Saxe wrote many poems and was greatly in demand as a lecturer. The later years of his life were spent in Albany, N.Y., at the home of his son. His principal writings include: "Money King and Other Poems," "Fables and Legends of Many Countries," "Masquerade," and "Leisure Day Rhymes."

Saxe, MAURICE, MARSHAL, soldier, born at Goslar, Germany, Oct. 28, 1696; died Nov. 30, 1750. He was a son of Augustus II, Elector of Saxony, and the Countess of Königsmark. In 1708, when only 12 years old, he left home and joined the army of Marlborough in Flanders, and was present at the capture of Lille and the siege of Tournay. He joined the Russian army stationed in Poland in 1711, taking part in the Battle of Riga, but in 1714 returned to his home in Dresden. After obtaining an allowance from his father, he went to Paris in 1720 to study military tactics, and in 1726 became Duke of Courland, from which he was compelled to retire after resisting the allied Russians and Poles for three years. His brother, *Augustus III,* succeeded his father to the throne of Saxony and offered him command of the Saxon army, but he declined and accepted instead a command in the army of France. For distinguished services at Ettingen and Philippsburg he was made Marshal of France, in 1744. He commanded the French army in Flanders with superior skill in 1745, and won a victory over the English under the Duke of Cumberland at Fontenoy. In 1746 he defeated the allies at Rocoux and the following year was victorious over their forces at Lawfeld, Bergenop-zoom, and Maestricht. The Peace of Aix-la-Chapelle soon followed. It may be said that the decided advantages gained by France are due largely to the military genius of Saxe. Soon after he took up his residence on his estate at Chambord, France.

Saxe-Altenburg (*săķs-äl'tẹn-bûrg*), a former duchy of Central Germany, whose nucleus fell to the Margrave of Meissen about 1329, and which later, with Meissen, joined the electorate of Saxony. From 1603 to 1672, Saxe-Altenburg was a separate duchy, and in 1825, resumed this status under Frederick, previously Duke of Saxe-Hildburghausen. The rulers were overthrown by the German revolution in 1918, and the land was incorporated into the free state of Thuringia. The territory, with an area of 511 sq. m., had its capital at Altenburg. See *Thuringia.*

Saxe-Coburg-Gotha (*săķs-ķō'bûrg-gō'tȧ*), a former duchy of Central Germany, which fell to the Wettin dukes in the 14th century and to the Ernestine branch of the family in 1485. After much partitioning, the duchy came under the rule of Duke Ernest in 1826, after he had exchanged Saalfeld for Gotha. When Ernest II

SUBMISSION TO CHARLEMAGNE OF THE SAXONS UNDER WITTEKIND

died in 1893, his title fell to his nephew Alfred, son of his brother Albert and Queen Victoria (*q.v.*) of England. Alfred's nephew, Charles Edward, Duke of Albany, reigned from 1900 to 1918 when, following the revolution in Germany, Saxe-Coburg-Gotha was divided between the free states of Bavaria and Thuringia, Saxe-Gotha falling to the latter country. The territory had an area of 763 sq. m., with capitals at Coburg and Gotha.

Saxe-Meiningen (*săk̦s-mī′nĭng-ȩn*), a former duchy of Central Germany, founded (1681) by Bernard, the third son of Ernest the Pious, Duke of Saxe-Gotha. In 1826, Duke Bernard added 530 sq. m. to his original territory of 423 sq. m. by including the duchies of Saxe-Saalfeld and Saxe-Hilburghausen, and the districts of Kamburg, Kranichfeld, and Themar. In 1829, the ruler granted a constitution, and introduced a number of liberal reforms in 1848. Saxe-Meiningen joined the North German Confederation in 1866 and the German Empire in 1871. In 1918, the ducal family was overthrown by the general revolution, and in the following year Saxe-Meiningen became part of the free state of Thuringia. The capital of the duchy was Meiningen. See *Thuringia.*

Saxe-Weimar-Eisenach (*săk̦s-vī′mär-ī′zȩn-äk̦*). See *Thuringia; Weimar.*

Saxhorn (*săk̦s′hôrn*), a wind instrument much used in military bands. It was invented at Paris, France, in 1842 by Adolphe Sax, a native of Belgium. It has a long, winding tube with a wide, bell-shaped opening, has from three to five valves, and possesses a large compass with full, rich tone. Several sizes and varieties are in use, thus supplying the necessary instruments to make up a whole band, but the tone is not sympathetic enough for orchestral use. Military music has been much influenced by the saxhorn and another instrument by the same inventor called the *saxophone* (*q.v.*).

Saxifrage (*săk̦′sĭ-frĭj*), an extensive genus of hardy perennial herbs, with alternate leaves and simple flower stems. They are distinguished by a many-seeded capsule, have leaves 6 to 7 in. long, and the stalks are 1 to 2 ft. high. The flowers are yellow, white, or red, and most of the plants grow in rocky places, to which their clustered roots are well adapted. About 160 species have been described, many of them being domesticated for ornamental garden plants, and fully 50 are native to America. Plants of this genus are confined largely to the colder and temperate parts of the Northern Hemisphere. A species known as *beefsteak,* or *strawberry, geranium,* is a common house plant.

Saxons (*săk̦′sŭnz*), one of the races of people that originally inhabited the northern part of Germany, called *Sachsen* in the German. They are first mentioned in history by Ptolemy, in whose time they occupied a large region between the Elbe, Trave, and Eider Rivers. By the 3d century of the Christian era their numbers had increased materially and they organized themselves into a confederation, which occupied the northwestern part of Germany. Subsequently they formed an alliance with the Franks. They invaded Roman territory in the times of Emperors

Julian and Valentinian, and about the same time made settlements on the coasts of Gaul and Britain. It is probable that the first Saxon settlements were made in Britain as early as 287, but their union with the Angles and Jutes appears to have been formed about 450, and about that time they conquered a large region in Britain, giving to the people of England the name of *Anglo-Saxons*. Their principal settlements in England were in Sussex, or South Saxony, and Essex, or East Saxonland.

The Saxons remaining in Germany occupied a vast region that became known as *Alt Sachsen*, or Old Saxony, but its limit cannot be easily defined, since frequent wars against invading tribes changed the boundaries at various times. It may be generally defined as including the country inclosed by the North Sea, the Harz Mts., the Rhine, and the Elbe, bordering on the territory of the Franks. In 785, the Saxons submitted to the Franks under Charlemagne. At that time they gave up paganism and adopted Christianity as their religion. See also *Anglo-Saxon Chronicle; Wittekind.*

Saxony (*săks′ŭn-ĭ*), a state of Germany, in the southern part of the Soviet Zone of Occupation, lying north of Bohemia and west of Silesia. The length from east to west is about 135 m.; breadth, 75 m.; and area, 5,788 sq. m. Practically all of Saxony lies in the Elbe Basin, being drained by that river and its tributaries, the Elster, Mulde, and Spree Rivers. A small part in the east is drained into the Oder by the Neisse. It is separated from Bohemia by the Erzgebirge and slopes gradually toward the north, most of the surface being fertile and undulating.

PRODUCTS. The country has valuable deposits of granite, iron, silver, tin, nickel, lead, bismuth, cobalt, zinc, arsenic, antimony, and coal. The mines are among the most important of Germany, especially those producing iron and coal. The soil products include cereals of all kinds, vegetables, pears, apples, plums, and grapes. Cattle, horses, cows, swine, sheep, and poultry are produced in abundance. Before World War II the manufactures included large quantities of cotton and woolen goods, ribbons, silk textiles, chinaware, tobacco products, leather, chemicals, printing and bookbinding, and machinery. Saxony is traversed by more than 2,000 m. of railroads.

GOVERNMENT. Before World War II, Saxony was divided for governmental purposes into the five districts of Leipzig, Dresden, Chemnitz, Bautzen, and Zwickau. The right of suffrage is vested in both sexes. Lutheranism is the state religion, but all religious forms are tolerated. Before World War II, the Univ. of Leipzig was the recognized head of its educational affairs. Saxony had an excellent system of public schools, including kindergartens, elementary schools, gymnasia, and *Realschulen*. Dresden is the capital. Other important cities are Leipzig, Plauen, Chemnitz, Freiberg, and Zwickau.

HISTORY. The people of Saxony are descendants from the *Sachsen*, or Saxons. They were subdued by Charlemagne and embraced Christianity, but the territory now included in Saxony does not correspond to the region then occupied by them, which was farther toward the north. It was made a dukedom in 880, when Otto became the first duke, reigning until 912. He greatly extended the territory by conquests from the Normans, and his son, Duke Henry (912-936), became Emperor of Germany in 919. The duchy passed to the Bavarian branch of the Guelph family in 1127, and Rudolph II (1356-70) assumed the title of Elector of Saxony.

John George I (1611-56) sided with the Protestants in the Reformation and joined Gustavus Adolphus, his army taking part in the Battles of Breitenfeld and Lützen. Frederick Augustus I (1694-1733) embraced Catholicism in 1697 to become King of Poland, after which time the court of Saxony was Roman Catholic, but the state religion remained Protestant. Frederick Augustus II (1733-63) joined the War of the Austrian Succession against Maria Theresa. During the Seven Years' War the country was ravaged, and it was many years before prosperity was fully restored. Frederick Augustus III (1763-1827) first fought against France, but his army went over to Napoleon's side after the Battle of Jena, and he received in return the title of king, and large additions of territory.

Saxony became the battleground between Napoleon and the allies in 1813. Within its confines were fought the decisive battles of Lützen, Dresden, Bautzen, and Leipzig. When the Congress of Vienna, in 1814, adjusted the division of territory, a large part of Saxony was turned over to Prussia (*q.v.*). Peace was not disturbed after that until the Revolution of 1848-49, but in the Austro-Prussian War of 1866 Saxony sided with Austria, and was immediately invaded by a Prussian army. After the war Saxony joined the North German Confederation. When Napoleon III declared war against Prussia, in 1870, Saxony rallied to the support of the German states. In 1871, it became a part of the German Empire, and a Free State after the revolution of 1918. During World War II, Saxony was heavily bombed and eventually taken by the Allies in 1945. Population, *ca.* 5,000,000.

Saxophone (*săk′sō-fōn*), a wind musical instrument with a reed mouthpiece, as in a clarinet, and a bent conical tube. It is equipped with 20 finger keys. The saxophone is used extensively for solo playing and for bands and orchestras. It was invented in 1840 by Adolphe Sax.

Saxton (*săks′tŭn*), JOSEPH, inventor, born in

Huntingdon, Pa., Mar. 22, 1799; died in Washington, D.C., Oct. 26, 1873. After attending public schools, he became apprenticed to a watchmaker. He later moved to Philadelphia. There he invented a machine for cutting the teeth of watch wheels, an invention that revolutionized the art of making watches and clocks. He constructed the clock for the tower of Independence Hall. In 1828 he went to England, where he remained until 1837, and while there constructed a magneto-electric machine and a locomotive differential pulley. His later inventions include an immersed hydrometer, a deep-sea thermometer, and a self-registering time gauge.

Say (*sĕ*), JEAN BAPTISTE LÉON, economist and cabinet member, born in Paris, France, June 6, 1826; died Apr. 21, 1896. He secured a liberal education, made political economy a special study, and after the fall of Napoleon III supported the republic. In 1871 he became a member of the national assembly, was made minister of finance by M. Thiers the following year, and in 1875 was again appointed to the portfolio of finance in the administration of M. Buffet. This position he held in the succeeding administrations, and in 1880 became ambassador to London, but returned to Paris a few weeks later, having been elected president of the senate. He wrote a number of works on history and political economy, and in 1880 was honored by membership in the Academy of Moral and Political Sciences.

Say (*sā*), THOMAS, entomologist, born in Philadelphia, Pa., 1787; died in 1834. Trained as a zoologist and geologist, Say became a member of several early scientific expeditions, including explorations of Florida, Georgia, and the Rocky Mts. His important study of the insects of America won him the title of father of entomology in America. He also made a vital contribution to the development of conchology in this country. It is said that he discovered more previously unknown insect species than any other scientist in the history of entomology. Among his definitive books describing his discoveries are "American Entomology" (3 vols., 1824-28) and "American Conchology" (completed by W.G. Binney, 1858).

Sayce (*sās*), ARCHIBALD HENRY, philologist, born near Bristol, England, Sept. 25, 1846; died Feb. 4, 1933. He studied at Grosvenor Coll. and at Oxford, and became tutor at Queen's Coll. in 1870. Six years later, he became deputy to Max Müller as professor of philology, a position he held until 1890. In the latter year he visited Egypt, where he studied Egyptian inscriptions. Among his writings are "Fresh Light from the Ancient Monuments," "Principles of Comparative Philology," "Ancient Empires of the East," "Higher Criticism and the Verdict of the Monuments," "Races of the Old Testament," and "History of Babylonia."

Sayre (*sā'ẽr*), a borough in Bradford County, Pennsylvania, 58 m. N.W. of Scranton. It is on the Susquehanna River and the Lehigh Valley R.R., and is surrounded by a coal-mining and agriculture region. The manufactures include machinery, hardware, clothing, and farming utensils. The region was settled in 1840. Sayre was incorporated in 1891. Population, 1950, 7,735.

Scab (*skăb*), a popular medical term denoting (1) the crust formed by the drying of serum oozing from lesions such as abrasions, open sores, or ulcers of the skin; (2) a common skin disease of sheep, also seen to a lesser extent in cattle and other domestic animals, caused by a tiny parasitic insect similar to the human itch-mite (*q.v.*) which burrows under the skin, producing loss of hair and intense itching. The sites of infestation become secondarily infected from rubbing against contaminated surfaces in attempts to relieve the itching, resulting first in oozing, then crusted, sores, from which the disease is named. Treatment consists of dipping or spraying affected animals in troughs containing solutions of turpentine, nicotine, arsenic, or mercury compounds.

Scabbard Fish (*skăb'ẽrd fĭsh*), a fish of the mackerel family, distinguished by having a continuous spinous dorsal fin. The body is elongated, the teeth are pointed and cutting, and the caudal fin is forked. Several species grow to a length of 5 or 6 ft. They swim with much velocity, waving through the water like a long and wide ribbon of silver, displaying beautiful reflections with the change of light.

Scabies (*skā'bĭ-ēz*), or SARCOPTIC MANGE, a parasitic skin disease caused by the *sarcoptic* or *itch mite,* a tiny insect about 1/70 in. long, widely prevalent in groups of people with poor personal hygiene habits. It is transmitted by contact with unclean clothing and bedding. In the individual infested with scabies characteristic linear red marks appear in the skin between the fingers, on the backs of the hands, elbows, groins, abdomen, breasts, legs, back, etc. These lesions are made by the itch-mite's burrowing in the epidermis and laying their eggs behind them in the burrows, causing intense itching. Frequently secondary infection occurs from the victim's scratching himself in the infested areas. Treatment formerly consisted of applications of various sulphur-containing ointments and boiling infested clothes. The newer, highly efficacious treatment consists of a hot soap-and-water bath followed by painting or spraying the entire skin with an emulsion of benzyl benzoate, along with disinfestation of all clothing and bedding with DDT powder or spray.

Scabious (*skā'bĭ-ŭs*), a genus of herbaceous plants, native to the Eastern Hemisphere. Common in the U.S. are the blazing star of Devil's Bit, and the button-snakeroot.

Scaevola (*sĕv'ô-lȧ*), GAIUS MUCIUS, legendary hero of ancient Rome. Attempting to kill the Etruscan prince, Lars Porsena, who was besieging Rome in 509 B.C., Scaevola, in error, killed the Etruscan's secretary. Porsena ordered him burned alive, but, when Scaevola showed indifference to torture by thrusting his right hand into the fire until it was consumed, Porsena let him go free. Scaevola's heroism led to the saving of Rome and ultimately to peace.

Scald (*sk̦a̤ld*) or SKALD, a class of Scandinavian poets who flourished from the 9th to the 13th centuries, and whose writings celebrated the deeds and exploits of their warriors and ancestors. The first scalds were Norsemen, but they were later surpassed by Icelandic scalds, many of whose names survive in histories.

Scale (*sk̦āl*), in music, the regular succession of notes in the order of pitch. In its simplest form, the scale consists of seven steps or degrees counted upward or downward from a keynote, with the eighth added to form the octave. A continuous scale is formed by joining seven, eight, or more octaves. The tones and semitones of the octaves in their natural order constitute the *diatonic scale,* as A, B, C, D, E, F, G, A. In modern music only two forms of the diatonic scale are in use, the *major* and the *minor*. The major scale is composed of whole tones except for the intervals 3-4 and 7-8, which are half tones; the minor scale is composed of whole tones except for the intervals 2-3 and 5-6, which are half tones.

Scale. See *Weighing Machine.*

Scale Insect (*sk̦āl ĭn'sĕk̦t*), the common name of a class of destructive insects, frequently called *bark̦ louse,* or *scale bug.* The distinguishing features are that the female is wingless, that both sexes have legs which terminate in a single claw at the tip of a tarsus, and that the male has two wings. The body is covered with small scales, which in some species are naked and in others are covered with minute hair or minute down. These insects gather in large numbers on plants and injure them by sucking the juices. They are especially harmful to hothouse plants and many fruit-bearing trees. Some of the species produce several broods in a year. Alkaline washes are effectual in checking their ravages, both within and without the greenhouse. In some states and countries it is required that nursery stock must be examined by an official before it can be sold, this precaution being necessary to protect orchards from scale insects. Young trees that contain these pests may be fumigated with hydrocyanic acid.

Scales (*sk̦ālz*), the name applied to protective plates that arise from the skin of various animals, such as fishes and snakes. The purpose of such scales is to protect the body. In lizards and snakes the scales are formed by the cutis, but they are attached to the skin and adhere to it when the latter is shed. Some lizards are almost without scales, and in some animals they are so small that they can hardly be seen without the microscope. Some mammals are scaly, such as the scaly ant-eater and the scale-tailed squirrel.

The term *scale* is applied in botany to the bracted leaves which protect the delicate organs of plants, as in the leaf buds of some species during the winter.

Scallop (*sk̦ŏl'lŭp*), the name of several species of shellfish, so called from their round, ribbed shell with scalloped edges. They are classed as bivalves, having shells connected at the upper side with a hinge. The shells are fan-shaped and have numerous green eyes on the inner fold or mantle. The animal swims by means of a little air bag inside, and it is facilitated in movement by opening and shutting its shell. Young scallops are frequently seen swimming in the water, but the older animals attach themselves to rocks, where they remain stationary like oysters. The term *scalloped oysters* was derived from the circumstance that the shell was used frequently in cooking oysters. Scallops abound in almost all seas, about 200 species being known, many being edible. In the Mediterranean, off the coast of Palestine, scallops are quite abundant and were caught from remote antiquity, their shells being converted into souvenirs for those visiting the Holy Land. A number of species are abundant off the coasts of New England and the Middle States, where they are caught extensively for food.

Scalp (*sk̦ălp*), the skin forming the outer covering of the skull. It is the same as the skin growing on other parts of the body, except that it has a more prolific growth of hair and is composed of an expanded muscular tendon in addition to the ordinary skin, which is permeated by many blood vessels. The term scalp is generally applied to all the part of the skin of the head which is covered with hair. The American Indians used the scalping knife to remove a part of the scalp from those killed or taken captive in war. Frequently the victim was alive when the scalp was being removed and the victims sometimes survived the operation, though of course remaining bald. Indian warriors who secured the greatest number of scalps were held in high esteem, and it was a matter of pride to wear a large number dangling from the belt as trophies.

Scammony (*sk̦ă'mǫ-nē*), the common name for a medicinal product and the plant from which it is derived, *Convolvulus scammonia,* a native of the eastern Mediterranean area. It grows as a vine and belongs to the morning glory family; its flowers resemble those of common bindweed in the same family. The product, known in pharmacy as virgin scammonium, is the dried sap obtained from incisions in the fleshy roots. It contains the compound jalapin, now derived from jalap (*q.v.*), and acts as a powerful cathartic. Known since early in the Christian era, it is little, if at all, used in medicine today.

Scanderbeg (*sḳăn'dẽr-bĕg*), patriot and prince of Albania, born in Croia about 1404; died at Alessio, Jan. 17, 1468. His proper name was George Castriota, the son of John Castriota. Scanderbeg is the name applied to him by the Turks, meaning Alexander Bey. The Turks took him a captive when seven years old. His physical beauty and intelligence so pleased Sultan Amurath II that he was brought up in his palace in the Moslem faith. He received instruction in the Turkish, Slav, Arabic, and Italian languages, and upon reaching maturity was put at the head of a Turkish army. In 1433 he greatly distinguished himself as a Turkish pasha. Soon after, on learning that his father's estate had been confiscated, he resolved to return to his native land. He accordingly deserted the Turkish army in 1443, taking with him a number of Albanians, and renounced the faith of the Moslems. All of Albania was soon in arms under his leadership, and with an Albanian army of 15,000 he repeatedly defeated the Ottoman forces. Mohammed II took the field against him in person, but was obliged to accept terms of peace. It was the ambition of the Pope to secure a powerful Christian alliance to aid Scanderberg, but this plan was not successful. However, Scanderberg maintained the independence of Albania for 24 years, and in the meantime defeated the Turks in many battles. The Turks conquered Albania shortly after his death.

Scandinavia (*sḳăn-dĭ-nā'vĭ-ȧ*), anciently the name of the region now included in the kingdoms of Sweden, Norway, and Denmark. At present it is variously applied to the language and literature of the people occupying this region and Iceland. The Scandinavian Peninsula is situated in the northwestern part of Europe. It is bounded on the east by Finland, the Gulf of Bothnia, and the Baltic Sea, south by the Skagerrak and Kattegat, west by the Atlantic, and north by the Arctic. It is 1,240 m. long, from 225 to 260 m. wide, and has an area of 298,000 sq. m. The two kingdoms of Sweden and Norway occupy the whole of the peninsula, and south of it, across the Skagerrak and Kattegat, is the kingdom of Denmark. A Teutonic people occupied most of the region in the early historic period of Europe. The inhabitants of the territory now included in Denmark and Schleswig were known to the Romans by the name of Cimbri, and the region occupied by them, as the Cimbrian Peninsula. In the 9th century large numbers of Northmen moved in their galleys along the coasts of Europe, visiting England, France, Germany, Spain, and Italy. In these movements they plundered cities and the coast regions, but founded new states and materially influenced the industries and the language. Scandinavian literature includes a number of valuable works, the most notable being the Icelandic *sagas* and *eddas*. See also *Iceland*.

Scapa Flow (*sḳä'pȧ flō*), a sea basin in the Orkney Islands, Scotland, area about 60 sq. m. It was the principal British naval base during World War I. The German fleet which had surrendered to the Allies under the terms of the Armistice was interned in Scapa Flow in January 1919. On June 21, 1919, a week before the signing of the Versailles Treaty, 53 of the ships were scuttled and sunk by their crews; however, many of these ships were salvaged. During World War II it was an almost impregnable base for many of the British fleet's most powerful vessels. Once, however, on Oct. 14, 1939, a band of German submarines managed to pass through the protective barriers, sinking the British battleship, *Royal Oak*, and killing some 800 British sailors.

Scapula (*sḳăp'ū-lȧ*), the shoulder blade, a triangular bone of the upper trunk, forming a part of the shoulder. In form it is flat and irregular, suitable for the attachment of many muscles. In man it is located back of the chest. It is not fully ossified until the age of 25 years.

Scarabaeus (*sḳăr-ȧ-bē'ŭs*), an extensive genus of insects, including about 3,000 species. The greater number are native to the tropical regions, but species of the genus are found in nearly all countries. Those found in the warm climates include the largest of beetles and the size decreases in the colder latitudes, those found in Central North America and Europe being comparatively small. The *dung beetles* are well known types of this class of insects. They are useful in warm and temperate countries for their habit of removing offensive matter, which they roll in the form of balls. They often lay their eggs within the balls and bury them below the surface. The *sacred scarabaeus* of Egypt is another familiar kind. It is still the type for the Egyptian scarab, an ornament made in the shape of a beetle of hard stone or gems. This beetle was worshiped by the ancient Egyptians, and was even embalmed and mummified. Many of the tombs and monuments of Egypt contain representations, often accompanied by hieroglyphics. Many scarab gems were also engraved by the Greeks and Etruscans.

Scarfoglio (*sḳär-fō'l'yō*), SIGNORA. See *Serao, Matilda*.

Scarlet Fever (*sḳär'lẹt fēv'ẽr*), or SCARLATINA, a common acute contagious disease, caused by a special form of the hemolytic streptococcus called *Streptococcus scarlatinae*, affecting principally children up to 12 years of age. The usual method of contraction of the disease is through the nose and throat by direct or indirect contact with one who has an acute infection of scarlet fever or with a carrier (one who has had the disease and still harbors live organisms). Occasionally local epidemics may arise from drinking milk from infected cows. The condition is most prevalent in the cold months when streptococcal nose and throat infections are more common and children are kept in closer contact indoors. This disease usually manifests itself two to four days after contact with an infected person by sudden loss of appetite, nausea, and vomiting, chills, headache, general aches, and sore throat. The temperature rises to 102° to 104° F. A pin-point red rash appears in the throat and mouth ("strawberry tongue") and then within 24 hours a red granular rash appears on the trunk and spreads to the rest of the body. The face is red save for a characteristic paleness around the mouth. The temperature drops gradually toward normal after about 4 days, but the rash lasts nearly a week. Two to three weeks after the onset of the disease the skin begins to peel, first in fine powdery scales, then in coarse flakes.

There are atypical variations of scarlet fever: (1) Mild cases with very slight symptoms other than scaling off of the skin; (2) "Septic scarlet fever" or *"scarlatina angiosa,"* a severe form with high fever, ulceration of the throat with profuse foul discharge from the nose and throat, and a prolonged stormy course; (3) "Toxic" scarlet fever, a severe form with extreme prostration, delirium, stupor, and convulsions, persistent diarrhea and vomiting, and a very heavy and sometimes hemorrhagic rash.

Complications of scarlet fever such as severe ear and mastoid infections, persistent foul discharge from the nose, infection of the lymph glands of the neck, septicemia (infection of the blood stream, or "blood poisoning"), acute nephritis (kidney infection), and painful and swollen joints, are common. Treatment includes isolation and quarantine (*q.v.*), administration of scarlet fever antitoxin and convalescent serum, and sulfa drugs, besides the usual supportive measures for the acutely ill.

Scarlet Letter, THE (*skär'lẹt lĕt'ẽr*), novel (1850) by Nathaniel Hawthorne (*q.v.*), depicting the punishment meted out by Puritan settlers to Hester Prynne, an adulteress.

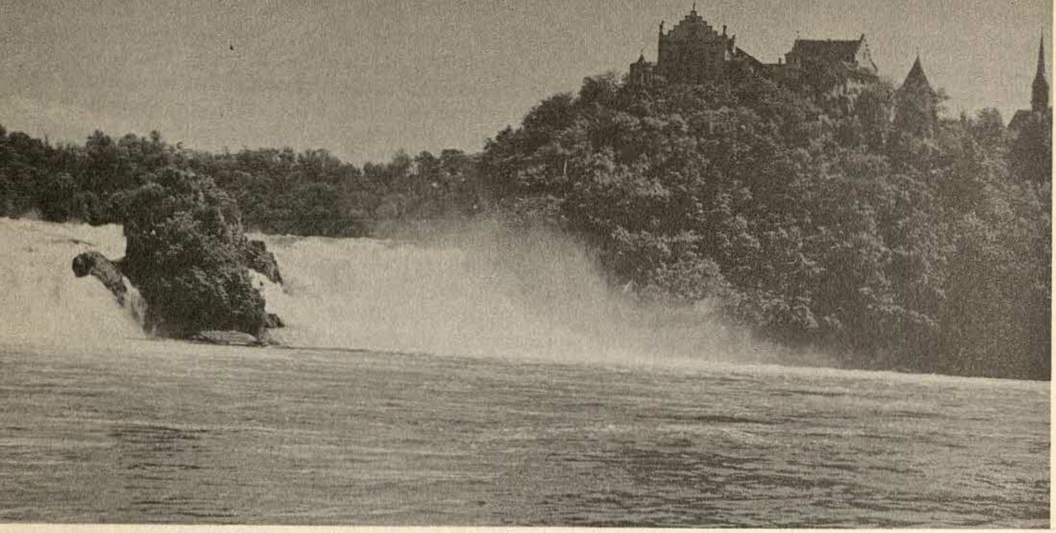
Scarron (*skȧ-rôn'*), PAUL, novelist and satirist, born in Paris, France, in 1610; died Oct. 16, 1660. He studied to enter the church, but soon gave himself up to a gay and dissolute life. Nervous diseases crippled and distorted him at an early age. He then applied himself to literature and soon acquired a reputation for his caricatures and humorous sketches. The Queen of France gave him a pension from her private purse and he was aided by the Bishop of Le Mans, which enabled him to make his house a center of French society. In 1652, he married Françoise d'Aubigné, who afterward became the mistress of Louis XIV as Madame de Maintenon. He is the author of numerous comedies and burlesques, several of them serving as models for plots by Molière and Beaumarchais.

Scaticook (*skă'tĭ-ko͝ok*), a remnant of the Housatonic Valley Indian tribes, gathered on a small state reservation of the same name, in Kent Township, Connecticut, between the Housatonic River and the New York State line. The dozen or so remaining descendants are of mixed blood and have lost most of their language and customs.

Scaup (*skạp*), or SCARP DUCK, a bird resembling the pochard and widely distributed in the Northern Hemisphere.

Schacht (*shäkt*), HJALMAR HORACE GREELEY, economist, born in Tingleff, Germany, Jan. 22, 1877. His father, a merchant, brought his family to the U.S. when Schacht was an infant and resettled it in Germany when the boy was 12. Schacht was educated at the Univ. of Kiel, receiving (1899) a Ph.D. as one of Germany's first students to write his thesis on economics. Entering the banking field, he was assistant manager of an influential banking firm (1908-15), and during World War I was appointed economic administrator in occupied Belgium. Subsequently he became managing partner in a bank which developed into one of Germany's most powerful financial institutions. Appointed currency commissioner (1923), he succeeded in halting the disastrous inflation and in securing German adoption of the Dawes Plan, which provided that Germany might pay war reparations largely in the form of goods. As president of the Reichsbank (the central bank of Germany) in 1923-30, he encouraged foreign investment and played an important role in the country's short-lived prosperity. Schacht resigned his government post when the Reichstag passed (1930) the Young Plan for monetary payment of reparations. When Hitler came to power (1933), he was recalled, and in the following year he was made minister of economics; his financial policies made it possible for Germany to rearm. In 1936 his post was put under the authority of Hermann Göring (*q.v.*), and Schacht was replaced by Walter Funk as economics minister (1937) and president of the Reichsbank (1939). During World War II he served as minister without portfolio. Acquitted as a major war criminal in the Nuremberg trials (*q.v.*), he was sentenced (1947) by a German denazification court to eight years in a labor camp, but he was released in 1949. In 1952 he founded Schacht and Co., a banking firm.

Schadow (*shä'dô*), JOHAN GOTTFRIED, sculptor, born in Berlin, Germany, May 20, 1764; died Jan. 28, 1850. He studied drawing and sculpture in his native city and at Rome, and in 1788 became professor at the Berlin Acad. of Art. Much



Courtesy Brown Bros., N. Y.

RHINE FALLS AT SCHAFFHAUSEN

of his time was spent in traveling in Southern Europe, but he continued to live at Berlin, where he executed many celebrated statues. Among his statues are those of Luther at Wittenberg, Blücher at Rostock, and Frederick the Great at Stettin. His works include "Hercules Slaying the Centaur," "Quadriga of Victory," and "Crown Princess Louisa and her Sister."

Schaff (*shäf*), PHILIP, American clergyman, born in Chur, Switzerland, Jan. 1, 1819; died in New York, Oct. 20, 1893. After studying at the Univs. of Tübingen and Halle, he took an extended course in Berlin, where he began to lecture on theology in 1842. The next year he was recommended to fill a professorship of church history in the Theological Seminary at Mercersburg, Pa., an institution belonging to the German Reformed Church. He entered upon this work in 1844. In 1862 he became lecturer on church history at Andover Seminary. After serving in that capacity until 1870, he was made professor in the Union Theological Seminary, New York City, where he lectured until 1893. Schaff served as president of the American committee on Bible revision in 1871, and was the founder of the American Society of Church History, an organization formed in New York in 1888. His last public discourse was delivered in 1893 before the parliament of religions in Chicago.

His most important work was the Schaff-Herzog "Encyclopaedia of Religious Knowledge," which he translated from the German, revised and edited. Among his other writings the 25-volume "Commentary on the Holy Scriptures" and the "History of the Christian Church" are most noteworthy.

Schaffhausen (*shäf-hou'zẹn*), a city of Switzerland, capital of the canton of Schaffhausen, 25 m. north of Zurich. It is finely situated on the Rhine, has electric and steam railway facilities, and is the center of a large trade in produce and merchandise. The chief buildings include the town hall, the museum and library, and several fine schools and churches. Two bridges cross the Rhine and connect it with Feuerthalen, on the opposite side of the river. It has manufactures of watches, textiles, machinery, pottery, and scientific instruments. Schaffhausen was long a free city, but joined the Swiss Confederation in 1501. Its early growth is due to the famous falls of the Rhine, which descend nearly 100 ft. in passing over three ledges. Most of the people are Protestants. Population, *ca.* 20,000.

Scharnhorst (*shärn'hôrst*), GERHARD JOHANN DAVID VON, military expert, born at Bordenau, Hanover, Nov. 12, 1755; died at Prague, Bohemia, June 8, 1813. One of the most famous of Prussian military leaders, Scharnhorst was chief of staff in the war against Napoleon Bonaparte (1806-07). In 1807, he was given the task of reorganizing the Prussian army, and it was he who introduced the short service system and by requiring military service for the general citizenry, changed a mercenary into a national army. In 1810, Napoleon forced Scharnhorst's retirement, but upon the defeat of the French in Russia (1812) he was appointed chief of staff under Gebhard von Blücher and in that capacity participated in the War of Liberation. He was seriously wounded in the battle of Lützen and died a few weeks later.

Schatchen (*shät'ḳẹn*), SHADCHAN, or SHADKAN, Hebrew meaning "the one who encourages," a term designating a Jewish marriage broker. The schatchen has long and commonly been employed in eastern Europe; the custom is known to have existed at least as far back as the 12th century. The occupation and the custom still survive wherever large colonies of Jews from eastern Europe have settled.

Schechter (*shĕḳ'tẽr*), SOLOMON, Jewish scholar, born in Fokshani, Rumania, in 1847; died Nov. 19, 1915. He studied in Vienna and

Berlin, and in 1892 was made professor at Cambridge Univ., England. In 1894 he lectured at Gratz Coll., Philadelphia, and visited many places of interest in the U.S. He went to Cairo, Egypt, to study Jewish literature, and while there discovered parts of the Jewish original of "Ecclesiasticus." On returning to England, he was awarded a degree by Cambridge Univ. and subsequently was professor of Hebrew Coll., London. In 1904, he was made president of the Jewish Theological Seminary in New York City, beginning active service the following year. His publications include "Studies in Judaism," "Wisdom of Ben-Sira," and "Saadyana."

Scheele (*shā'lẹ*), KARL WILHELM, chemist, born in Stralsund, Pomerania, Dec. 9, 1742; died in Köping, Sweden, May 21, 1786. He gained his early knowledge of chemistry as an apothecary's apprentice in Gothenburg, Sweden. After this eight-year training period, he worked as an assistant in shops in Malmö, Stockholm, and Upsala, while he continued to study and experiment on his own. He settled in Köping in 1775 and operated a pharmacy there until he died. His first published discovery, on the isolation of tartaric acid, appeared in 1770. Subsequent discoveries, which established his reputation as an original investigator and won (1775) for him membership in the Stockholm Acad. of Sciences, included the isolation of glycerine, the discovery of chlorine and baryta, and the discovery of arsenite of copper, which was named Scheele's green. He isolated oxygen gas, probably before Priestley did it in 1774, but his account was not published before 1777. He also isolated and studied many organic acids, including uric, citric, molybdic, and gallic acids.

Scheelite (*shēl'īt*), $CaWO_4$, a naturally occurring tungsten mineral, calcium tungstate. It is a source of tungsten used in the fabrication of tungsten steel, a high grade alloy of steel.

Scheffer (*shĕf'fĕr*), ARY, painter, born in Dordrecht, Holland, Feb. 12, 1795; died near Paris, France, June 15, 1858. He studied drawing in his native town and later in Paris, where he produced his first work in 1812. His paintings were influenced largely by Goethe, Byron, and Dante, from whose writings he selected many of his early subjects. His most noted paintings include "Faust in His Study," "Margaret at the Well," and "Christ on the Cross." Among his best portraits are those of Lamartine and Lafayette. His later works consist principally of scenes from the Bible.

Scheherazade (*shĕ-hä-rä-zä'dĕ*), the supposed narrator of a collection of Arabian folk tales, known as "Thousand and One Nights," or "Arabian Nights." Scheherazade relates to the Sultan, one thousand and one tales of such fascination that he is unable to fulfill his intention of executing her until he has heard her story to the end. By this time, however, the Sultan has abandoned his harsh plan. A symphonic suite, "Schéhérazade" (1888), by Rimsky-Korsakov is based on this legendary character, as is also an overture "Schéhérazade" (1889) by Maurice Ravel.

Schelde (*sk̨ĕl'dẹ*). See *Scheldt.*

Scheldt (*sk̨ĕlt*), a river of Europe, one of the most important of Belgium and The Netherlands. It rises in the French department of Aisne, flows north through Belgium, and enters the North Sea by two arms, known as the Eastern and Western Scheldt. The entire course is 260 m., of which about 210 m. are navigable. Among the flourishing cities on its banks are Ghent and Antwerp. Numerous canals connect it with other river systems, forming a very important commercial highway.

Scheler (*shāl'ĕr*), MAX, philosopher and sociologist, born at Munich in 1874; died at Frankfort-on-the-Main, in 1928. He became an instructor in philosophy at the Univs. of Jena (1902) and Munich (1907), and in 1910 retired to devote himself to writing in Berlin. At the end of World War I, he received special assignments to go to Geneva and The Hague for the foreign office, and then became professor of philosophy and sociology at the Univ. of Cologne (1919-28); in 1928, he joined the faculty of Frankfort Univ.

Although originally a disciple of Rudolf Eucken (*q.v.*) and indirectly of Kant (*q.v.*), Scheler's real importance lies in his representation of the phenomenological (*q.v.*) point of view based on the philosophy of Rudolf Husserl (*q.v.*). He concentrated especially on ethical, religious, and social problems which he interpreted by a peculiar fusion of phenomenological and Catholic concepts. He analyzed the values of existence and of the various emotions, and postulated a gradation of concrete values. He defined "ethos" and the values of good and evil as determined by preferences. Finally he combined research in sociology, anthropology, and psychology into an examination of the position of man within the universe. His main works are "The Genius of War and the German War" (1915), "The Transcendental and the Psychological Methods" (1922), "The Position of Man in the Universe" (1928), and "Man and History" (1929).

Schelling (*shĕl'ĭng*), ERNEST HENRY, pianist, composer, and conductor, born in New Jersey in 1876; died in 1939. After completing his musical education, Schelling began (1903) a series of successful concert tours in the U.S., Europe, and South America. During World War I he fought in France with the American Expeditionary Force, attained the rank of major (1918) in the cavalry, and was later (1923) awarded the D.S.M. Increasingly popular as a conductor, he directed such outstanding American orchestras as those of New York, San Francisco, Boston, Philadelphia, and Cincinnati. His work as conductor of the Baltimore Symphony Orchestra (1936-38) brought new distinction to that organization.

Schelling, FRIEDRICH WILHELM JOSEPH, philosopher, born in Leonberg, Württemberg, Germany, Jan. 27, 1775; died in Ragatz, Switzerland, Aug. 20, 1854. He was educated at the cloister school of Bebenhausen, where his father was a chaplain and Oriental scholar. At the age of 16 he entered the theological seminary at Tübingen and became very much interested in the philosophy of Fichte, Kant, and Spinoza. Among his fellow students were the philosopher Friedrich Hegel, and the poet Friedrich Hölderlin. He later studied at Leipzig and Jena and, in 1798, was appointed professor of philosophy at the Univ. of Jena, where both Fichte and Hegel (*qq.v.*) were already lecturing. At that time, Jena was famous as a center for writers and philosophers of the Romantic movement. Actually, Schelling now became the philosophical counterpart of the Romantic poets and the whole movement of German Romanticism (*q.v.*) cannot be understood without studying his philosophy.

A few years earlier, Schelling had published several philosophical treatises based particularly on Fichte's idealism, but revealing independent thought and a tendency toward the more realistic applications of Spinoza. With later works, he displays an increasing interest in nature and science and begins to depart more definitely from Fichte's method. The most important of these works is "System of Transcendental Idealism" (1800). He has now formulated his philosophy of identity (*identitäsphilosophie*) involving a more objective conception of nature. Nature and the individual spirit are to him two aspects of one absolute reality. Both exist separately, but in their ultimate issue they are identical and complementary parts of the whole. The ultimate reality transcends the conflict between the real and the ideal; in itself it is neither object nor subject. In an effort to combat attacks on this featureless Absolute, Schelling turned for mystical inspiration to Giordano Bruno (1548-1600) and Jakob Boehme (1575-1624), attributing an almost personal character to the Absolute.

Embittered by his philosophical quarrels with Fichte and Hegel and disturbed over the latter's increasing influence at Jena, Schelling accepted a post at the new Univ. of Würzburg in 1803. He married Caroline Schlegel after her divorce from his friend August Wilhelm Schlegel (1803). He lived in Munich from 1806-41, lecturing at the Acad. of Sciences and later at the new Univ. of Munich. His only important work of this period was "Studies on the Nature of Human Freedom" (1809). From that time, although his philosophical system was still developing, he ceased to publish any of his works, and the final phase of his philosophy was not known until after his death.

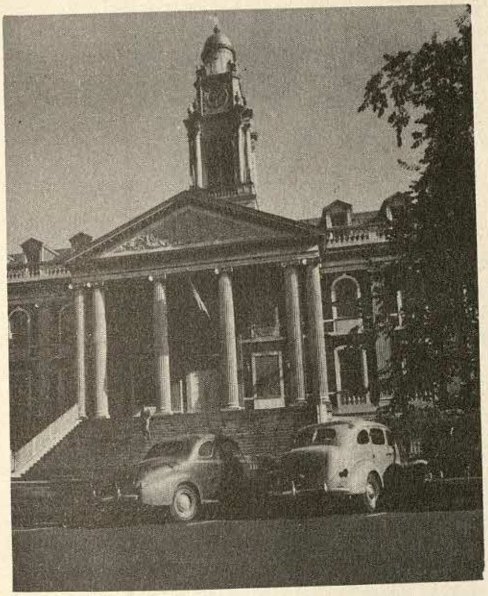
FRIEDRICH WILHELM SCHELLING

Beginning in 1841, he lectured for a few years at the Univ. of Berlin and attempted to counteract Hegelian theories. From this epoch stem "Introduction to the Philosophy of Mythology," "Philosophy of Mythology," and "Philosophy of Revelation," which all appeared posthumously. In these works, he traced the historical evolution of the idea of the divine as revealed in mythologies and religions and presented his opposition of negative and positive philosophies. Schelling was not able, however, to neutralize the ideas of Hegel, which dominated philosophy of the 19th century, even in the fields of philosophy of law and philosophy of government.

Schenectady (*skę-nĕḳ′ta̭-dĭ*), a city in New York, seat of Schenectady County, on the Mohawk River, *ca.* 16 m. N.W. of Albany. Schenectady is on the New York State Barge Canal and is served by the Delaware and Hudson and the New York Central R.R.'s. Situated in the Mohawk Valley, it covers an area of 11.34 sq. m., at an elevation of 220 ft. Its park system, comprising 552 acres, is divided into more than ten parks, the largest of which is Central Park. Noteworthy city features include the Schenectady County Historical Society, the Robert Sanders home (dating from colonial times), and the Schenectady Museum.

The city, an important industrial center, produces electrical apparatus and supplies, diesel-electric locomotives, mica insulation materials, varnish products, wiring devices, knit goods, baseballs, and cement products. It is the site of the largest plant of the General Electric Co. and its general offices, as well as of installations of the American Locomotive Co. The city also serves as a business and commercial center for the surrounding agricultural area.

Such educational and cultural institutions as Union Coll. (founded 1795; annual enrollment, *ca.* 2,500), a symphony orchestra, a light opera company, and the Civic Playhouse with its classical and modern drama productions, have been established here. Important medical facilities include the Schenectady County Tuberculosis Hospital and Sunny View, the Eastern New York Orthopedic Hospital.



Courtesy Schenectady Chamber of Commerce

CITY HALL, SCHENECTADY, NEW YORK

First settled by Dutch traders *ca.* 1661, Schenectady received an Indian name, meaning "end of trail." A borough charter was issued in 1684. The site was the scene of a massacre during the French and Indian Wars in 1690. In 1798 it was incorporated as a city, and in 1935 a city-management type of government was adopted. Population, 1890, 19,902; in 1940, 87,549; in 1950, 91,785; in 1960, 81,682.

Schick (*shĭk*), BÉLA, pediatrician, born in Boglár, Hungary, July 16, 1877. He received an M.D. degree (1900) from Karl Franz Univ., Graz, Austria. From 1902 to 1923 Schick was associated with the Univ. of Vienna. During this period he developed the Schick test for determining susceptibility to diphtheria, which he published in 1913. Emigrating to the U.S. in 1923, he was naturalized in 1929. Schick served as chief pediatrician at Mt. Sinai Hospital, New York City, from 1923 to 1942. In the latter year he joined the staff of Beth El Hospital, Brooklyn, as director of pediatrics, a post he held until his retirement in 1962. In 1936 he was appointed clinical professor of children's diseases at Columbia Univ., and he later served as consultant for a number of New York hospitals. In 1957 his name was given to the new department of pediatrics at the Albert Einstein Coll. of Medicine. He is the author of books and articles on scarlet fever and tuberculosis, on allergy, and on the nutrition of infants and children.

Schildkraut (*shĭlt'krout*), JOSEPH, actor, born in Vienna, Austria, March 22, 1895. He came to the U.S. with his father (*see below*) in 1910 and for three years studied at the American Acad. of Dramatic Arts in New York City. Living in Europe until 1920, he appeared in increasingly important roles in Berlin and Vienna, under Max Reinhardt and Alfred Bernau. He was featured in such Broadway productions as "Liliom" (1921), "Peer Gynt" (1923), and "The Firebrand" (1924). He made his motion-picture debut in "Orphans of the Storm" (1922) and later divided his time between the stage and the screen. He won an Academy Award in 1938 for the 1937 characterization of *Captain Dreyfus* in "The Life of Emile Zola." More recently, Schildkraut achieved special acclaim for his Broadway appearance in "The Diary of Anne Frank" (1955). He has appeared on television, starring on his own program in 1953.

Schildkraut, RUDOLPH, actor, born in Rumania in 1865; died in Hollywood, Calif., July 16, 1930. He made his debut in Vienna, Austria, in 1893 and soon afterward achieved stardom there and in Hamburg and Berlin, where he was especially successful as *Shylock* in "The Merchant of Venice." He made several trips to the U.S., appearing in German and Yiddish plays in New York City after 1910; his English-speaking debut occurred in New York City in 1922. From 1926 until his death, he also played roles in motion pictures.

Schiller (*shĭl'ĕr*), JOHANN CHRISTOPH FRIEDRICH VON, poet, dramatist, and philosopher, born in Marbach, Germany, Nov. 10, 1759; died in Weimar, May 9, 1805. The son of an army surgeon, Schiller received his early education under tutors and in a school at Lorch. In 1773 he entered a military academy at Ludwigsburg. He studied law and medicine but soon began to write poetry and dramatic pieces. His first play, *"Die Räuber"* ("The Robbers"), was published in 1781 and received a successful production at Mannheim in 1782. Schiller, then serving as an army doctor in Stuttgart, was arrested for two weeks for his literary activities and an unauthorized trip to Mannheim. Upon his release, he fled to Bauerbach, Thuringia, and continued writing. During a brief connection with the Mannheim theater, he produced two more plays, *"Kabale und Liebe"* ("Cabal and Love"), dealing with local politics, and *"Die Verschwörung des Fiesko zu Genua"* ("Fiesco"), a historical drama, in 1784.

In 1785 Schiller went to Leipzig at the invitation of Christian Gottfried Körner, a literary critic and editor of the first edition of Schiller's

FRIEDRICH VON SCHILLER

collected works (1812-15), and later accompanied him to Dresden. There he wrote *"Ode an die Freude"* ("Ode to Joy," 1785) and completed the classic tragedy "Don Carlos" (1787), a work in blank verse that established his reputation as a poet. To this period also belong *"Der Verbrecher aus Verlorener Ehre"* (1786), a dramatic tale, and *"Der Geisterseher"* ("The Ghost-Seer," 1789), a novel. In 1788 he published the first volume of his *"Geschichte des Abfalls der vereinigten Niederlande"* ("History of the Revolt of The Netherlands"). At the instance of Johann Wolfgang von Goethe (*q.v.*), Schiller obtained a professorship at the Univ. of Jena in 1789; in the following year he married Charlotte von Lengefeld.

Granted a pension by the prince of Holstein-Augustenburg, Schiller spent three years in philosophical studies and began to evolve his aesthetic theories. He was strongly influenced by Immanuel Kant's *"Kritik der Urteilskraft"* ("Critique of Judgment"). He published *"Uber Anmut und Würde"* (1793), *"Briefe über die ästhetische Erziehung des Menschen"* ("Letters on Aesthetic Culture," 1795), and *"Uber Naïve und Sentimentalische Dichtung"* ("On the Naive and Sentimental in Poetry," 1796). In 1793 he completed his *"Geschichte des dreissigjährigen Krieges"* ("History of the Thirty Years' War").

The next period saw the production of some of Schiller's finest lyric poetry and ballads, among the latter being *"Der Taucher," "Die Kraniche des Ibykus," "Der Gang nach dem Eisenhammer," "Die Burgschaft,"* and *"Das Lied von der Glocke."* The lyric poems include *"Die Ideale," "Der Spaziergang,"* and *"Das Ideal und des Leben,"* all reflecting his preoccupation with philosophy. Many of these were published in *Musenalmanach,* an annual founded by Schiller in 1796.

After 1798 Schiller lived at Weimar to be near Goethe, who had become a close friend and correspondent. Inspired by Goethe, who was then directing a theater in Weimar, Schiller began the writing of his classic dramas, the first and perhaps greatest of which was the trilogy "Wallenstein" (1798-99), based on the Thirty Years' War. This was followed by "Maria Stuart" (1800); *"Die Jungfrau von Orleans"* ("The Maid of Orleans," 1801); *"Die Braut von Messina"* ("The Bride of Messina," 1803), constructed on the model of Greek tragedy; and his last work, "Wilhelm Tell" (1805), a historical drama.

In common with others of the Romantic generation, Schiller was frequently articulate in protest against oppressive social conditions; his efforts in this area were perhaps one of the greatest sources of his appeal for the German people. Out of these ideas and his study of philosophy grew his aesthetic theories and his definition of beauty as *Freiheit in der Erscheinung* (freedom incarnate). In essence, Schiller maintained that great social change is brought about by individuals of high moral character and that such character is conditioned by aesthetics, since art is the link between primitive force and human liberty.

Schirra (*shĭ-rä′*), WALTER M(ARTY), JR., Navy officer, astronaut, born in Hackensack, N.J., March 12, 1923. After a year at Newark Coll. of Engineering, he was appointed to the U.S. Naval Acad. and was graduated high in his class in 1945. During the Korean conflict (1950-53), Schirra flew 90 combat missions, winning the Distinguished Flying Cross and two Air Medals. Later he became a Navy test pilot, and in 1961 he was selected as one of the first seven U.S. pilots to be trained for space travel in the Project Mercury program. On Oct. 3, 1962, in a space capsule called the Sigma 7, he made the first U.S. six-orbit flight around the earth.

Schism (*sĭz′m*), from the Greek *schisma,* meaning "split," a term applied in Church history first to the cleavage that occurred between the eastern and western Church in 1054. The schism was caused by underlying differences in theological attitude traceable to the Church of the 4th century, political tensions between the east and west, and cultural variations, but mainly by the refusal of the patriarch of Constantinople to recognize the bishop of Rome's claim to universal ecclesiastical authority. Attempts to heal the schism failed as late as the meeting (1439) of the Council of Florence.

The second, Western, or Great, Schism took place in the 14th century within the Roman Catholic Church as a result of the claims to political supremacy within the Church by France and Italy. In 1378 Urban VI was elected pope in Rome, but a dissenting faction of French cardinals chose Clement VII, who ruled from Avignon, France, as did his successors until the early 15th century. A third claim to papal authority issued from Pisa, Italy, from 1409 to 1417. The schism was healed by action of the Council of Constance (1414-18), when the three claimants to papal power were supplanted by Martin V, who was elected pope of Rome.

Schist (*shĭst*), a layered (foliated) crystalline rock composed essentially of silicate minerals, but in which the layers are thinner than those of a gneiss (*q.v.*), and are commonly of similar rather than contrasting mineral composition. The layering, or *schistosity,* is due to the parallel arrangement of grains of markedly different sizes and shapes, such as mica flakes or hornblende prisms; this arrangement imparts an excellent cleavage to the rock, and the cleavage is more perfect than that of a gneiss. Schists belong to the class of metamorphic rocks, and generally represent the recrystallization, with or without chemical change, of pre-existing rocks, chiefly the finer-grained sedimentary and igneous varieties. Common varieties are named for the predominant mineral constituent, such as *mica schist, chlorite schist, hornblende schist, talc schist,* etc.

Schists, like gneisses, are of widespread distribution; they occur commonly together with gneisses among the areas of older (pre-Cambrian) rocks of the earth's crust, but like gneisses do not necessarily have a specific age significance, for both schists and gneisses have formed abundantly in areas of later rocks, especially those subjected to intense mountain-building forces. Among the notable areas of schistose rocks in North America are central, eastern, and southern New England, the southern Appalachians, the Adirondacks, the Lake Superior region, and many scattered areas in the Cordilleran region. Outside America, schists are extensive in Norway and Sweden, India, Siberia, and Africa.

Schizophrenia (*skĭz-ô-frē′nĭ-ȧ*). See *Psychiatry.*

Schlegel (*shlā′ḡẹl*), AUGUST WILHELM, critic and poet, born in Hanover, Germany, Sept. 8, 1767; died May 12, 1845. He studied classics and philology at Göttingen, and soon attracted attention as a writer and critic by contributing to various magazines. Later he became lecturer on literature and fine arts at the Univ. of Jena. He was elected to a similar professorship at Berlin in 1802, at Vienna in 1808, and at Bonn in 1818. While at the last-named institution he devoted himself largely to the study of Oriental history, made numerous translations from foreign writers into the German language, and lectured on philology and the history of fine arts. His translations into the German include large parts of the work of Dante, Shakespeare, Cervantes, Camoëns, and Calderón. His translation of Shakespeare is still the most classical in the German language. He was ennobled in 1818.

Schlegel, FRIEDRICH VON, historian and critic, born in Hanover, Germany, Mar. 10, 1772; died in Dresden, Jan. 11, 1829. He was a brother of August Wilhelm Schlegel, studied philology at Göttingen and Leipzig, and entered upon a literary career. His first writings were contributions to journals and periodicals, and in collaboration with his brother he edited *The Athenäum,* a magazine devoted to literary criticism, and soon became the leading spirit of German Romanticism (*q.v.*). He was also among the first students of the Sanskrit and Indo-European languages. In 1808 he became councilor of the legation for Austria in the Frankfort diet, serving in that position until 1829, and in the meantime wrote the famous proclamations made by Austria against Napoleon. "Lucinde" is his chief work. His wife was the daughter of Moses Mendelssohn and assisted him in a number of his writings.

Schleiermacher (*shlī′ẽr-mä-ḵẽr*), FRIEDRICH DANIEL ERNST, philosopher and theologian, born in Breslau, Germany, Nov. 21, 1768; died Feb. 12, 1834. The son of a Protestant chaplain of the Prussian army, he received his early education in the schools of the Moravian brotherhood, and a deeply religious spirit characterized his entire life. He entered the Univ. of Halle in 1787 and became a pastor at Landsberg in 1794. In Berlin, while serving as chaplain to the Charité Hospital (1796-1802), he studied Plato, Kant, and Spinoza, and came under the influence of his great contemporaries, the philosophers Hegel, Fichte, Schelling, and Jacobi. He helped Friedrich Schlegel to edit the *Athenäum,* a periodical of the Romantic Movement. In 1799, he published his "Discourses on Religion," in which he attempted to separate religion (which he considered intuitive) from ethics and knowledge. Schleiermacher served as pastor at Stolpe, Pomerania (1802-04), and became preacher and professor of theology at the Univ. of Halle in 1804. He returned to Berlin after the Battle of Jena, in 1807, and became pastor of the Trinity Church. The first of his critical and philosophical works, "Grundlinien einer Kritik der bisherigen Sittenlehre," appeared in 1803. With the founding of the new Univ of Berlin, in 1810, he was given a chair of theology, and he became secretary to the Acad. of Sciences. He took an active part in the movement for national liberation and exerted an important influence on the reorganization of the Protestant Church and the development of theological education in Germany.

Schleiermacher's most outstanding work, "Der Christliche Glaube nach den Grundsätzen der Evangelischen Kirche" (1821-22), ranks as one of the greatest contributions to Protestant theological thought. Essentially it was an effort to reconcile religion and theology with the advances of science and philosophy. Schleiermacher was able to articulate his philosophical ideas in the most lucid and poetic language. He also wrote some typical Romantic poetry. His effect on religion can hardly be overestimated; he appeared at a period when the aftermath of Enlightenment (*q.v.*) most pervaded the intellectual scene, and his idealistic and at the same time tolerant interpretation of the divine truth gave new life to German Protestantism.

Schlesinger (*shlā′zĭng·ēr*), ARTHUR MEIER, historian, born in Xenia, Ohio, Feb. 27, 1888. He was graduated from Ohio State and Columbia universities, returning to the former to teach American history (1912-19). He headed the history department of the State Univ. of Iowa (1919-24), was professor of history at Harvard Univ. (1924-54), and also taught at the universities of London, Edinburgh, and Leyden. His books include "Paths to the Present" (1949) and "Rise of Modern America, 1865-1951" (1951). With D. R. Fox he edited "A History of American Life" (13 vols., 1927-48).

Schlesinger, ARTHUR MEIER, JR., historian, born in Columbus, Ohio, Oct. 15, 1917. He was graduated from Harvard Univ. in 1938 and became professor of history there in 1946. Between 1943 and 1945 he was with the Office of Strategic Services. In 1952 and 1956 he wrote some of Adlai E. Stevenson's Presidential campaign speeches. In 1961 President John F. Kennedy appointed him special assistant, in which capacity he helped formulate U.S. policy on Latin America. Schlesinger's works include "The Age of Jackson" (1945, Pulitzer Prize, 1946), several books on the Franklin D. Roosevelt era; and "Kennedy or Nixon; Does It Make Any Difference?" (1960).

Schleswig-Holstein (*shlĕs′wĭg hōl′stīn*), a region (*ca.* 10,000 sq. m.) in the most northerly part of the West German Federal Republic, occupying the Jutland or Cimbric peninsula. The land is level or gently rolling, with the eastern part indented by deep and narrow fjords. It is traversed by the Kiel Canal (*q.v.*). Agriculture is the principal occupation of the region, which also produces iron and peat. Fishing is extensive offshore. Shipbuilding and ship repair form the chief industry; others include machine shops, textile mills, and sugar refineries.

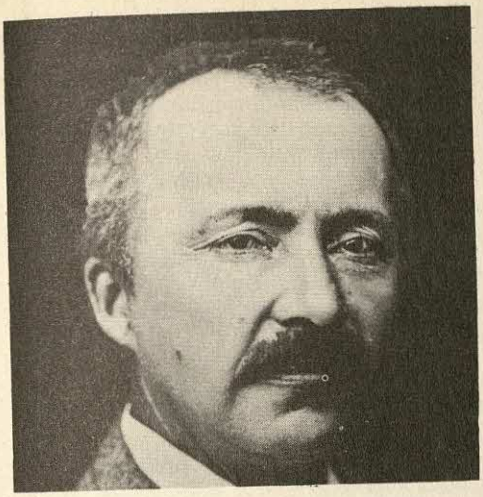
Schleswig was controlled in the 9th century by the Danish kings, and in the 10th century it was incorporated into a Danish kingdom. Late in the 14th century it passed to the counts of Holstein. When the Holstein dynasty became extinct in 1460, Schleswig and Holstein united in choosing Christian I of Denmark as their ruler, but with the understanding that they should be neither separated nor made a part of Denmark. In 1864, Schleswig-Holstein became a victim of Prussia's power politics; Christian IX of Denmark was compelled to cede it to Austria and Prussia. At first the two powers compromised: Holstein was annexed to Austria and Schleswig to Prussia, the latter at the same time purchasing the Austrian territory of Lauenburg. This agreement ultimately caused the Seven Weeks' War, in 1866, in which Austria was defeated and Holstein also became part of Prussia.

Following World War I a plebiscite was held, which resulted in the return to Denmark of a northern zone comprising *ca.* 1,500 sq. m. and having a population of *ca.* 180,000. In 1940 German troops reannexed the zone lost to Denmark during their conquest of Denmark and Norway. The last German military headquarters of World War II was at Flensburg, in northern Schleswig-Holstein. The region was taken by the Allies early in 1945 and was incorporated into the British zone of occupation. It now forms a *land* or state of West Germany. The inhabitants are almost exclusively Germanic in descent, but the Danish and Plattdeutsch languages are spoken in some localities. Population, 1959, 2,289,900.

Schley (*slī*), WINFIELD SCOTT, naval officer, born in Frederick County, Maryland, Oct. 9, 1839; died in New York City, Oct. 2, 1911. He was graduated from the U.S. Naval Acad. in 1860, and his first Civil War assignment was as master of the *General Parkhill*. After the war he held various assignments, becoming captain in 1888 and commodore in 1898. In the latter year he took command of a squadron at Hampton Roads, which led him to the blockade of Santiago de Cuba and the destruction of Cervera's fleet on July 3, 1898. For this he was made rear admiral.

Subsequently discussion arose as to the respective merits of the commanders in the Santiago campaign, known as the Schley-Sampson controversy. It reached its height when Edgar S. Maclay published the "History of the U.S. Navy," in which he charged Schley with disobedience and cowardice. The Navy Dept. then appointed Adm. Dewey and Rear Admirals Ramsay and Benham as a court of investigation. In a decision announced on Dec. 12, 1901, Ramsey and Benham censured Schley for his conduct in the Santiago campaign but exonerated him of cowardice; Adm. Dewey in a minority report gave him the honor of the victory. See also *Sampson, William T.*

Schliemann (*schlē′män*), HEINRICH, archaeologist, born in Neu Buchow, Germany, Jan. 6, 1822; died in Naples, Italy, Dec. 27, 1890. The son of a Lutheran pastor, he was apprenticed at an early age to a tradesman and thus came in contact with businessmen of various countries. He visited Holland in 1842 and there acquired knowledge of many modern European languages as well as Greek and Latin. In 1850 he went to Sacra-



HEINRICH SCHLIEMANN

mento, Cal., and engaged in the banking business until 1866. He went to Asia Minor in 1869 to make excavations on the site of ancient Troy and other famous cities, and in 1874 published "Troy and Its Remains."

He obtained permission from the government of Greece, in 1876, to excavate on the site of Mycenae; this led to the discovery of several royal tombs and rich treasures of gold and silver, now deposited in a museum at Athens. The results of these explorations were published in his work entitled "Researches and Discoveries at Mycenae." He later made similar explorations on the island of Ithaca and elsewhere, and published his last two works, entitled *"Troja"* and *"Tiryns."*

Schmalkalden (*shmäl'ḳäl-dẹn*), a resort town of Germany, 30 m. s.w. of Erfurt. It is historically interesting because the League of Schmalkalden was drawn up there on Apr. 4, 1531. The compact, signed by several Protestant princes and heads of imperial cities, was intended to resist aggressive measures promoted by Emperor Charles V and the Catholic states. Soon other princes and cities joined the league, and in the time of its greatest strength it included all the Protestant states lying between northern Italy and the Skagerrak. In 1535 an extension of the league for 10 years was agreed upon, and a permanent army was raised to defend the religious and political freedom of the Protestants. A Catholic federation was formed in 1538 in opposition to the Protestant league, but the latter was joined by Francis I, King of France, and Henry VIII of England declared himself its protector, thus giving the Protestants such strength that Emperor Charles V found himself unable to contend against it. Mutual jealousy crippled the league. When a battle was ventured at Mühlberg on Apr. 24, 1547, the Protestants were defeated and John Frederick and several other leaders were taken prisoners. The objectives of the league, however, were reached through the defection of the emperor's former adherent Duke Maurice, Elector of Saxony, who declared war against the emperor and compelled him to grant the Treaty of Passau (1552). The final result was the Peace of Augsburg (1555), which recognized the Protestants and laid the groundwork for religious liberty in all of Europe. Population, about 12,500.

Schnabel (*shnä'b'l*), ARTUR, pianist and composer, born in Lipnik, Austria, April 17, 1882; died in Axenstein, Switzerland, Aug. 15, 1951. He studied piano (1891-97) under Hans Schmitt for two years and then under Theodor Leschetizky, the famous teacher of Paderewski. Schnabel himself became a teacher of music in 1895 and made his concert debut in 1896. He first appeared in the U.S. in 1921. Considered one of the most outstanding pianists and teachers in Europe and the U.S., he was especially noted for his interpretations of the works of Beethoven and Brahms, as well as Bach, Mozart, and Schumann. He edited the piano sonatas of Beethoven, and recorded these and Beethoven's five piano concertos.

He never played his own compositions in public. These compositions, which show the influence of the expressionist school, include three symphonies, a piano concerto, a quintet, three string quartets, a sonata and dance suite for piano, a sonata for violin, and a number of piano pieces and songs.

Schnabel left Berlin about 1933 and took up his residence in Italy; he came to the U.S. in 1938 and became an American citizen in 1945. His books include "Reflections on Music" (1933) and "Music and the Line of Most Resistance" (1942).

Schnitzer (*shnĭts'ẽr*), EDUARD. See *Emin Pasha.*

Schnitzler (*shnĭts'lẽr*), ARTHUR, author, born in Vienna, Austria, May 15, 1862; died there Oct. 21, 1931. He studied medicine at the Univ. of Vienna and practiced with his father for many years. He wrote steadily during this period, however, and eventually gave up medicine for literature. In 1891, the year in which his first play was produced, he helped to found the Young Vienna group. The latter was an organization of young writers, including Hugo von Hofmannsthal, who were responsible for bringing new life to Austrian literature. Schnitzler's numerous plays and novels are chiefly concerned with the gay and charming Vienna of his day. Later he began to turn his attention to serious subjects—death, prejudices, skepticism—particularly when he examined the plight of the Jew in his autobiographical novel "The Road to the Open" (1908; English translation, 1913), and in the play "Professor Bernhardi" (1912). Schnitzler's other plays include "Anatol" (1893; English translation, 1911), "Light-

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o' Love," "Comedies of Words," "Hands Around," "Intermezzo," "Countess Mizzi," "The Lonely Way," "The Hour of Recognition" "A Farewell Supper"; his novels and stories, "Viennese Idylls," "Casanova's Homecoming," "The Shepherd's Pipe and Other Stories," "Dr. Graesler," "Fräulein Else," "Lieutenant Gustl," "Beatrice," "None But the Brave," "Rhapsody," "Daybreak," "Theresa," "Flight Into Darkness," and "The Green Cockatoo."

Schnorr von Carolsfeld (*shnôr fôn kä'-rôls-fĕlt*), JULIUS, painter, born at Leipzig, Germany, Mar. 26, 1794; died May 24, 1872. In 1827 he was made professor at the Acad. at Munich, where he decorated several noted buildings with frescoes from the *Nibelungenlied* and encaustic paintings of subjects in the history of Charlemagne and Frederick Barbarossa. He was made director of the picture gallery at Dresden in 1846. His principal productions include "Alms of St. Roche," "Luther at the Diet of Worms," and "The Bible in Pictures."

Schofield (*skō'fēld*), JOHN MCALLISTER, soldier, born in Chautauqua County, New York, Sept. 29, 1831; died Mar. 4, 1906. After his graduation from the West Point Military Acad., in 1853, he became an assistant professor there (1855-60). He volunteered at the beginning of the Civil War and was made major of the First Missouri Volunteers. He commanded under Gen. Nathaniel Lyon on the Battle of Wilson's Creek, in which the latter was killed, and in November 1861, he was made brigadier general, commanding the Missouri militia and the army of the frontier. In 1864 he was given command of the army of the Ohio and accompanied Sherman on his southern campaign, taking part in the capture of Atlanta. Soon after he defeated Hood at Franklin, Tenn., took part in the Battle of Nashville, and in 1865 was sent with his corps to North Carolina, capturing Wilmington and Kingston, and in March joined Sherman at Goldsboro. He drew up the articles for the surrender of Gen. Johnston and from 1866 to 1868 commanded the Virginia military district. In 1868 he succeeded Edwin M. Stanton as Secretary of War, but resigned the following year to become major general of the U.S. army. He was superintendent of the U.S. Military Acad. from 1876-81, and in 1888 succeeded Gen. Sheridan as general-in-chief of the U.S. Army with headquarters at Washington.

Scholasticism (*skô-lăs'tĭ-sĭz'm*), a philosophical and theological term denoting various systems of philosophy and theology which flourished from the early Middle Ages (*ca.* 800) until the 16th century. There are, however, later important representatives of Scholasticism as well, some living today. The word Scholastic came down from Roman antiquity; and from the time of the foundation of the ecclesiastic schools by Charlemagne (*q.v.*), the thinkers and teachers of the Catholic Church were called *Doctoris Scholastici.*

Scholasticism lasted through seven centuries and changed from century to century, from school to school, sometimes even from individual to individual. Two facts, however, are characteristic of all Scholastic philosophy and theology: its definite leaning on the teachings of the Catholic Church; and its strictly logical, formal method of thinking and drawing conclusions. Ancient philosophers originated their own systems, modern philosophers scrutinize and examine previous systems of philosophy, sometimes developing their own ideas. In contrast to both, all Scholastic philosophers, differing though their systems may have been, had one background in common: they thought the thoughts of a Christian society, based on revealed religion and on the tradition of antiquity, rooted in the systems of Plato and Aristotle (*qq.v.*). Although Scholastics recognized the difference between reason and faith, their deepest problems remained essentially theological problems, even when they considered themselves pure theoretical philosophers. Instrumental in their process of thought was logic and a deductive formal method of thinking developed by the Greeks, since it was Greek philosophy which was the only one which, to a certain degree, had influenced the development of early Christian thought. Actually, not nearly so many Greek sources were known to the early Scholastics as are known today. They knew Plato's "Timaeus," certain late Neo-Platonic works (see *Neo-Platonism*), and some of Aristotle's logical writings, but the majority of Aristotle's writings became known to later Scholastics only through translations from the Arabic.

The main problem of early Scholasticism was the conflict between Realism and Nominalism (*qq.v.*), *i.e.*, whether universal ideas stood for real things or were only abstractions. This problem occupied the Scholastics deep into the 13th century. The form of their scientific writings had already been set by Alcuin of Tours (730-804), who stabilized the *trivium* (the study of grammar, rhetoric, and logic) and the *quadrivium* (the study of arithmetic, geometry, astronomy, and music). On this scheme of the "liberal arts," all later studies were based. During early Scholasticism, St. Augustine (*q.v.*) and Boethius (*ca.* 480 to *ca.* 524) were the predominant non-classical writers who influenced the thinking of the Scholastics. The two greatest Scholastics of this period were John Scotus Erigena (died 877) and St. Anselm of Canterbury (died 1109). St. Bernard of Clairvaux (died 1153) was the leading figure who stood against early Scholasticism. See also *Mysticism.*

The so-called Golden Age of Scholasticism in the 13th century was based on the knowledge of the metaphysical and physical works of Aristotle, which had been by then translated into Latin, and on the interpretations of his Arabian commentator, Averroes (1126-98). Now the metaphysics of Aristotle shared in the Revelation as the basis of Scholastic thinking. Universities began to rise at Paris, Oxford, and Bologna, and it was at these schools and with the spiritual leaders of the mendicant orders, especially the Franciscans and Dominicans (see *Monasticism*), that the highly dialectic discussions about the relationship between the more theological approach (Augustinianism) and the more philosophical approach (Aristotelianism) within Scholasticism took place. Here representatives of each side often indulged in subtle and actually meaningless hairsplitting. Bonaventura (*q.v.*), who lived at this time, combined in his writings the Scholastic and the mystical approach. The climax of this golden age is found in Albertus Magnus (died 1280) and especially in St. Thomas Aquinas (died 1274), the latter integrating Augustinianism and Aristotelianism.

The next period of Scholasticism in the 14th and 15th centuries was characterized by the resurgence of Nominalism through the influence of William of Ockham (*q.v.*). The controversies between Realists and Nominalists became a fight between the Thomists, the followers of Thomas Aquinas, and the Scotists, the followers of Duns Scotus (*q.v.*).

After the 15th century, Scholasticism lost its importance, although some great Thomistic works were still written, especially in Spain in the 16th century. Even Protestantism in the writings of some of its theologians sometimes took on a Scholastic tint.

Recent resurgences of Scholasticism occurred in the last part of the 19th century, especially in Italy, Germany, and Belgium. Pope Leo XIII issued (1879) a special encyclical, *"Aeterni Patrus,"* to stimulate this new development, which was continued in the 20th century chiefly influenced by the Belgian, Cardinal Mercier.

Neo-Scholasticism in the 20th century actually might better be called Neo-Thomism, since it expounds the ideas of Thomas Aquinas and tries to integrate Platonic and Christian ideas. Its foremost scholars are the Frenchman, Jacques Maritain, and the American, Mortimer Adler. Indirectly, the latter's ideas have strongly influenced education in this country, especially at the Univ. of Chicago and at St. John's Coll., Annapolis. See also *Humanities; Liberal Arts; Liberal Arts Education.*

Schönberg (*shön'bĕrk*), ARNOLD, composer, born in Vienna, Austria, Sept. 13, 1874; died in Brentwood, Calif., July 13, 1951. At the age of 16 Schönberg resolved to become a musician; he participated in amateur chamber music ensembles for several years, practiced constantly on the violin and cello, and often composed his own duets, trios, and quartets. Thus far largely self-taught, Schönberg showed his compositions to Alexander von Zemlinsky, an authority on Brahms. The master was impressed by his genius, and gave Schönberg counterpoint lessons.

At first, Schönberg supported himself by scoring other composers' operettas, but, meanwhile, his own compositions were beginning to be performed. He wrote his *"Verklärte Nacht,"* a sextet for strings, quite in a post-romantic mood, in 1889, and around 1900 began to work on his famous ballad cycle, the *"Gurre-Lieder,"* arranged for soloists, chorus, and orchestra, first performed in 1913. Schönberg became Kapellmeister of the Uberbrettl, a Viennese cabaret with artistic tendencies, in 1901, and a few years later, Richard Strauss obtained a scholarship and a teaching post for him at the Stern Conservatory in Berlin.

Thus far, Schönberg's compositions had remained more or less in the classical tradition, showing the influence of Wagner, Brahms, Strauss, and Mahler, but with his symphonic poem, *"Pelleas und Melisande"* (1902-03), he began to seek a change of form. The change became more evident in his "String Quartet in D Minor," Opus 7 (1905), and in his "Six Songs for Orchestra," Opus 8. His powerful and complicated harmony was on the verge of departing from tonality.

Scientifically, he searched for a new tonal system, and indeed laid the foundation with what he called the "12-tone" system, characterized by the absolute equality of the 12 chromatic tones of the tempered scale. Thus the usual tonal relations were abandoned.

This new dimension was evident in a more definite sense with the appearance of his *"George-*

ARNOLD SCHÖNBERG

Lieder" (1907), his "Second String Quartet in F Sharp Minor" (1907), and his "Piano Pieces," Opus 11 and Opus 19 (1907-11), which were distinctly atonal. The first performances of these works and his famous *"Pierrot Lunaire"* (1912), a melodrama for recitation and chamber music, aroused a veritable furor in Vienna. To this period also belong "Five Pieces for Orchestra" (1912), "Four Songs with Orchestra" (1913-15), and two music dramas, *"Erwartung"* (1909), and the monodrama, *"Die Glückliche Hand"* (1913).

Soon after his 50th birthday in 1924, he was asked to teach at Berlin's Prussian Acad. of Arts, remaining there until 1933. Needless to say, his work was classified as "degenerate art" in Nazi Germany. After 1938, he became a member of the faculty at the Univ. of Southern California, and he became an American citizen in 1940. He published several important books on musical theory and composition which embodied his theories on philosophy and aesthetics. These are "Treatise on Harmony," "Manual of Counterpoint" (1911), "Theory of Composition" (1940), and "An Outline for Composition" (1943). Schönberg was definitely the outstanding figure in the development of 20th-century music, influencing the younger generation strongly, with Alban Berg as the most important representative of his school.

Schongauer (*shôn'gou-ẽr*), MARTIN, copper engraver and painter, born *ca.* 1445 in Colmar, Germany; died in 1491 at Breisach on the Rhine. He was the son of a goldsmith who had come from Augsburg to Colmar. Schongauer is one of the first important masters of copper engraving; his 115 known copper engravings had considerable influence on the following generation. These engravings, with their distinct lines and tender character, show his connection with goldsmithing as well as with the art of Rogier van der Weyden, the Flemish master. Although Schongauer's copper engravings are all well known, including cycles of the Passion of Christ, scenes from the life of the Virgin, etc., it is believed that only one of the paintings attributed to him, the "Virgin with Child before the Rose Hedge," in the Museum of Colmar, is authentic. This work mirrors Schongauer's art at its height; its sincere deep emotion, anchored in Gothic tradition, fused with a broader, more human approach, foreshadows the Renaissance trend in the North.

Schoolcraft (*sḳo͞ol'ḳrȧft*), HENRY ROWE, explorer and ethnologist, born in Albany County, New York, March 28, 1793; died in Washington, D.C., Dec. 10, 1864. He attended Union and Middlebury colleges, where his specialties were language and geology. He made geology his first career, and searches for minerals took him into Indian country in Arkansas and Missouri and in the Mississippi and Lake Superior regions (where he traced the Mississippi to its source). His expeditions, which provided him with material for several published works, also gave him a knowledge of the Indians that led to his appointment (1822) as Indian agent for Lake Superior tribes. Thereafter, Indians were the dominating interest of Schoolcraft's life, an interest perhaps reflected in his marriage (1823) to a girl of mixed Indian and European blood. Later, while Superintendent of Indian Affairs for Michigan (1836-41), he negotiated a treaty with the Chippewas giving the U.S. title to 16,000,000 acres of land. During this period he published his notable "Algic Researches" (1839) on the Indian mentality. Numerous other Indian studies followed, the most impressive being "Historical and Statistical Information Respecting the History, Conditions, and Prospects of the Indian Tribes of the United States," a 6-volume work (1851-57).

Schools (*sḳo͞olz*), institutions maintained for giving instruction in arts, sciences, languages, or any other branches of learning. In the widest sense the term *schools* includes all establishments for systematic instruction of any kind or grade, from kindergarten to university, whether of a private or public character. Education in the earliest times was mainly domestic, being conducted by parents, and was largely religious in character. Public schools existed in the time of Babylonia and were introduced among the Hebrews shortly after the return from Babylonian captivity. The ancient Greeks maintained public educational institutions for the training of the young, not only in elementary branches, but in industrial arts, sciences, and languages. Similar schools were maintained by the Romans. In the Middle Ages educational institutions sprang into existence in many parts of Western Europe, but the schools were for centuries largely in the hands of the clergy and comparatively few laymen acquired an ability to read and write. This

TEACHER AND PUPILS. ROMAN RELIEF OF THE FIRST CENTURY A.D.

was favored by the fact that the scholastics devoted much time to hair-splitting theories of ancient philosophy and ecclesiastical discipline.

This condition continued unchanged until the revival of letters, when thought was first directed toward the investigation of natural sciences and toward the organization of schools designed to train the child from infancy, according to recognized and salutary methods of instruction. In this period there were two conflicting groups, the one holding that it is the duty of the state to supervise the education of the child from its first attendance at school until at least the elementary branches are mastered successfully, the other promoting the view that instruction should be under the guidance of the church. However, both groups became impressed with the need of instruction better calculated to result in the wholesome and progressive development of youth. In this respect they were influenced by the eminent teachers of Western Europe, including Pestalozzi, Froebel, Herbart, Rousseau, Rosenkranz, Ratich, Richter, Schlegel, and many others. Instead of making instruction conform to the strict formalities of ancient philosophies, these teachers directed attention to the laws of mental growth and development, and brought the child and teacher in contact with the living and vitalizing influences of nature.

Systems of Schools. Some historians claim that the first public and free school in America was founded by the Dutch in New York, but others maintain that the earliest was established in Massachusetts in 1635. The public schools of the U.S. and Canada are not organized on a national basis, but are under the direct control and supervision of the States and Provinces. Both governments have assisted in the establishment and maintenance of many institutions of learning by the reservation of public lands and by making appropriations for special purposes. The land granted for educational purposes in the U.S. was divided among elementary schools, mechanical and agricultural schools, and universities.

A national Commissioner of Education is the chief administrative officer of the U.S. Office of Education, which was created in 1867. The function of this office is to gather statistics of general interest and to publish and otherwise disseminate educational information. Between 1917 and 1933 there was an independent Federal Board of Vocational Education charged with administration of Federal funds, appropriated under the Smith-Hughes and other laws, to encourage agriculture and vocational education. Since 1933, by Executive Order, the Board of Vocational Education has become part of the U.S. Office of Education which, in turn, is now part of the Federal Security Agency. During World War II, the U.S. Office of Education was active in supervising and conducting special studies and programs regarding the war effort, *e.g.*, vocational training for war-production workers, food production, and war training.

Although there are many types of educational systems, nearly all are similar in many respects. The simplest system of school administration is the "school district" which is most common in rural areas. A school board, consisting of three members, directs school affairs, employing teachers and directing expenditures. It is charged with the responsibility of planning and supervising the educational program and establishing and maintaining educational standards. Undoubtedly educational standards in rural areas would be raised by consolidating, to a greater extent than is now the case, the several school districts of an area under central administration. In most instances the schools are under a superintendent of schools, or an officer having similar executive duties. In the smaller cities and in rural school districts he is often aided in the work of superintendence by county superintendents or similar officers, who have general supervision of the elementary schools in their respective areas. City superintendents are in most cases appointed by boards of education and principals are similarly chosen in the towns. In some cases supervisory officers have charge of the schools in the townships.

Public elementary schools give instruction in the fundamental branches of education, while secondary schools continue this course of study as well as provide specialized forms of study. In some rural districts these elementary schools are the only educational advantages provided, but there are generally township or county high schools. Some rural school systems seek to achieve essentially the same results by the employment of special teachers in the public and private schools.

In the smaller towns, a "graded" school is maintained, which provides facilities for an eight-grade school program. The larger towns usually provide a high school, which is distinct from the graded school and is normally housed in a separate building. Cities have a number of graded as well as junior high and high schools. In addition, the larger cities usually have one or more special high schools which provide instruction in various commercial and vocational subjects.

As a result of the introduction of the junior high school, chiefly after World War I, the public school systems in most large cities have been reorganized. Where the junior high school has been adopted, there are generally three divisions: a six-year elementary school course, a two- or three-year junior high school course, and a three- or four-year senior high school course. In some systems, two or more years are added to the secondary-school program, separately organized and known as "junior colleges."

Another innovation in American schools is the "platoon system" which makes it possible to increase the student body by as much as 100 per cent. Under this system, the children are divided into two groups, one of which is engaged in special activities while the other attends classes.

Public schools in the U.S. are in session from 166 days a year in one state to 186 in another, with an average of about 178 days. Some communities have adopted all-year schools, which continue in session for 48 weeks, dividing the school year into four 12-week quarters. These are a development of the summer or vacation schools and permit children either to complete their education in a shorter time by attending all four quarters or to omit any one quarter after attending and passing the others. Various other time schedules are occasionally followed, including eight-week and ten-week plans, with examinations and vacations occurring at specified intervals rather than at the traditional holiday periods such as Easter and Christmas.

The facilities and architecture of school buildings in the U.S., particularly in rural districts, vary widely. One of the most common types of building is the eight-grade elementary or graded school. This consists of eight rooms, one for each grade. As a rule, each classroom has its own coat room and has good heating, ventilation, and lighting facilities. Modern junior and senior high schools in large U.S. cities are beautiful and substantial edifices. They frequently

have large auditoriums, gymnasiums, swimming pools, and well-equipped lunchrooms.

Expenditures for public-school education in the U.S., exclusive of higher education, reach an annual average of over $9,000,000,000. These funds maintain schools and instruction for about 22,500,000 elementary pupils and more than 6,200,000 secondary students. The principal sources of revenue are state and local school taxes. Other sources include permanent school endowments, license taxes, fines and penalties, and, in some states, poll taxes.

Universities and colleges are maintained by all the states. Teachers colleges, also state-supported, provide professional training for elementary and secondary teachers. (In recent years increasing numbers of these schools have widened their course offerings and become generalized state colleges.) Practically all the states have provisions for the training of delinquent children. Manual-training and vocational schools and other institutions with special courses, as for the blind and the deaf, are also maintained.

Laws requiring all children to attend school have been enacted in most states. The period for school attendance is generally fixed by law from the age of 6 to 14 years or over. According to the U.S. Bureau of the Census (1950), 62,250,000 persons 25 years or older had completed at least eight years of schooling. The average daily attendance rate in the continental U.S. public schools in 1953-54 was 25,643,000.

World War II brought profound changes on the American educational scene. The public school systems suffered heavy losses in teaching staffs. There was a marked decrease in high-school and college enrollments, especially of male students; there were crowded classes, heavy teaching loads, and, in many cases, inferior or discontinued courses. The curriculum, too, felt the impact of the war, with the introduction of war subjects and the stressing of aeronautics and other technical studies. The problem of the shortage of teachers remained acute in both schools and colleges for a considerable time after the war. This condition was greatly aggravated by the return of large numbers of students to both high schools and colleges with a desire for education at an accelerated pace and for special courses, especially in the scientific fields.

An important reason for the dearth of qualified schoolteachers is the extremely low rate of pay for public-school teachers in the U.S. In 1953-54 the average annual earnings of public-school teachers amounted to only $3,825 compared with $4,156 for Federal employees (1951), $4,245 for the average member of the national labor force (1953-54), $7,820 for dentists and $13,432 for physicians (1951), and $10,258 for lawyers (1954). This condition is associated with a second important cause for the shortage of able teachers, namely, the laxity of state requirements. In 1949 only 26 states required four years of post-high-school training, and only 13 required at least two years of higher education. In six states less than two years of college work was acceptable, and in two there was either no definite scholarship requirement or a requirement of only a high-school diploma. These standards are, gradually, being raised.

The meager salaries received by teachers are an inevitable consequence of the altogether inadequate funds authorized by many states for education. The state funds spent per pupil in 1953-54 varied from a low of $92 (Mississippi) to a high of $309 (California), with a national average of $196. One solution to this problem is Federal educational allotments to the individual states. Proponents of this plan argue that Federal aid will raise educational standards throughout the nation and go far toward eradicating illiteracy. Opponents of Federal aid maintain that such aid will infringe on states' rights, constitute an excessive financial burden to the Federal government, and result in standardization, uniformity, and regimentation. Federal aid has, nevertheless, been provided for some purposes, *e.g.*, the school-lunch program of the Dept. of Agriculture and aid to schools in areas where children of employees of the Federal government are numerous. See also *Education; Gary, Ind.; Rehabilitation; Segregation; Springfield Plan; Universities and Colleges; Vocational and Technical Education; Vocational Guidance.*

PRIVATE INSTRUCTION. The advocates of both private and public education are still represented in large numbers in America and Europe. The term *private education* implies the instruction given by tutors or in schools other than those supported by the state, including the schools conducted as personal enterprises and those maintained by various religious denominations (parochial schools), societies, and numerous other organizations. These schools in some instances have come into conflict with public schools in matters of method and standards. In some countries private schools receive partial support from the government, as in Canada, but in the U.S. virtually no such aid is given, and all the parochial and other private schools are maintained voluntarily.

Private schools frequently appear in large, crowded cities where parents do not wish their children to attend overcrowded, heterogeneously grouped public classes; in other cases, the private school is preferred to the public because of religious instruction, special attention, progressive and experimental methods, etc. The preparatory school, chiefly for boys, is also a private institution, generally a boarding school, stressing preparation for entrance into the outstanding colleges and universities in the U.S. There are, likewise, numerous private schools for girls, some of them boarding schools and finishing schools, corresponding to grammar and high schools. Advocates of the public school maintain that free, public instruction offers better training for citizenship in a democracy and, by bringing the student into contact with a cross-section of the population, affords him a truer picture of life.

Elementary and secondary schools maintained by church groups give religious as well as secular instruction. There were *ca.* 11,575 Catholic parochial schools in the U.S. in 1958. Each Catholic parish must provide and maintain such a school, administered by a diocesan superintendent subject to a bishop or a diocesan board of education. Instructors are nuns or priests, and the curriculum, hours, etc., approximate those of the public schools in most instances, with the additional study of religion. Some Catholic children receive their elementary education in a parochial school and their secondary education in a public high school.

Religious instruction for public-school students has been widely discussed. The litigation brought by opponents of "released-time" instruction (in which students are allowed, upon the request of their parents, to attend off-campus instruction provided by religious organizations during school hours, while other students remain in class) finally resulted in a U.S. Supreme Court ruling (1952) that such training did not threaten the separation of Church and State.

Also controversial has been the provision of "peripheral" services to private-school students. While some feel that bus transportation, school lunches, and other welfare services should be provided to students regardless of the schools they attend, others insist that all expenses of private schooling should be met by the parents of private-school students.

Schools of Correspondence (*skōōlz of kŏr-ē-spŏn′dẹns*), or CORRESPONDENCE SCHOOLS, a class of educational institutions which teach their students by correspondence, in place of classroom work. Graded courses cover practically the entire field of learning. The correspondence school does not compete with the residence school. Its courses are, for the most part, taken by men and women long out of grade school, high school, or college, who cannot or do not expect to return.

The general plan of conducting schools of correspondence requires enrollment for instruction for a definite time, usually not less than three months, but the majority of courses cover a subject over a four-year period. Students receive their lessons by mail, doing the work at home, and examinations required at the end of a term are under the direct supervision of some responsible person appointed for that purpose by the correspondence school. The conducting of such an examination is merely supervisory, since the questions are furnished by the school or university with which the school of correspondence is associated, and the written examinations are returned and graded by examiners in the home school or office. The Univ. of Chicago has developed a plan for conducting instruction by correspondence, offering courses in about 30 departments, but students who expect to receive a degree are required to take two-thirds of the work by attendance at the institution. Institutions of this kind are now maintained by many colleges and universities, while others are organized by corporations which conduct the work entirely by correspondence.

The lessons were originally sent out in circular form, but now they are more generally published in a series of books. These books or volumes may be sent to the student from time to time as he progresses in his study, or he may purchase the entire course and have it delivered to him at the beginning, but most schools require each student to proceed in regular order. Promotions are based upon examinations at the end of each quarter. Under this plan the personal contact between the teacher and the student is replaced by notes and queries sent by mail from time to time. University extension courses, night schools, and vocational schools have contributed to the growth of correspondence schools.

Following World War I correspondence courses became a vitally important part of the educational program in public high schools. In 1923, correspondence courses in vocational subjects were introduced in the Benton Harbor (Mich.) high school by Sidney C. Mitchell. So successful was this experiment and so rapidly did the idea spread that by 1946 the "Benton Harbor Plan" had been adopted in roughly 10 per cent of the public high schools. The plan operates as follows: A director is appointed to supervise the correspondence study division of a public school; the students prepare their lessons under the director's supervision during a class period which is held each day; finally, the lessons are corrected by a co-operating home-study correspondence school which is selected by the public school. Among the courses offered are accounting, advertising, radio, salesmanship, journalism, commercial art, and many others.

During World War II the U.S. Armed Forces Institute (popularly called USAFI) was founded (based on the previously existing "Army Institute") for the dual purpose of enabling men and women to continue their education while in the armed forces, and of providing a means of utilizing off-duty time. With U.S. headquarters at Madison, Wis., and branch schools in nine theaters of war, the USAFI made available more than 500 courses covering a wide variety of subjects. Approximately 80 leading American colleges provided hundreds of correspondence courses. By January 1945, more than 850,000 service men and women were enrolled and many hundreds completed their college work and obtained degrees.

Schooner (*skōōn'ẽr*), a sailing vessel with two or three masts. Vessels of this class are built for fast sailing and are provided with fore-and-aft sails. There are many kinds of schooners, but the two chief classes are those known as *fore-and-aft rigged schooner* and the *topsail schooner*. The former are provided with fore-and-aft sails on two masts, and vessels of the latter class carry a square topsail and top-gallant sail. Schooners provided with three masts carry fore-and-aft sails on each mast. Schooners carried vast amounts of sea-borne traffic in the 19th century, but are now virtually obsolete.

Schopenhauer (*shō'pẹn-hou-ẽr*), ARTHUR, philosopher, born in Danzig, Germany, Feb. 22, 1788; died Sept. 21, 1860. He was a son of Johanna Schopenhauer (1770-1838), an author. After securing a secondary education in his native city, he was trained under the direction of his father, a banker, for a business career. However, he became interested in literature and entered the Univ. of Göttingen. Later he studied at the Univs. of Berlin and Jena. At the time of his graduation (1813) he presented an essay that contains the basis of his system, entitled "The Fourfold Root of the Principle of Sufficient Reason."

In Weimar, where he lived with his mother from 1814 to 1818, he came in contact with the leading thinkers of his time, who had gathered around Johann Wolfgang von Goethe (*q.v.*), a good friend of Schopenhauer's mother. Contact with these men supplemented the stimulation he had received during his study in Berlin under Fichte and Schleiermacher, who had induced in him a love of philosophy. Soon he began to publish works on philosophy and even one, "About Sight and Color" (1816), which in some ways anticipated modern psychological research. His collection of smaller writings, "Parerga and Paralipomena," became the most popular of all his writings. But his essential and central work, "The World as Will and Idea" (1819), although it was not popularly understood, influenced all later philosophy of the 19th century. Schopenhauer lived in Berlin (1825-31) after spending much time in Italy and Dresden. In 1831, he retired to Frankfort-on-the-Main, where he died in 1860.

Schopenhauer's philosophy is based on "The Critique of Pure Reason" by Immanuel Kant (*q.v.*). Like Kant, he takes the objects of so-called reality as ideas. Space and time are to him mere subjective *a priori* (*q.v.*) concepts. He does

ARTHUR SCHOPENHAUER

not believe, as Kant did, that to the subjective delusion of a thing something real at least corresponds (Kant's "Ding-an-sich," "thing-in-itself"). According to Schopenhauer, even this unknowable something probably has no existence, and the only essential reality in the world is our will. What seems to us to have a real appearance is, in the opinion of Schopenhauer, only a subjective representation of forms under which will manifests itself. The fourfold root of the "principle of sufficient reason," the topic of a work he had published in 1813, is in his opinion causality, knowing, being, and motivation. These reasons, however, are ruled by the anonymous undirected will. From the forces of nature to the human will to live, all of these are manifestations of one all-embracing will. Thus, the world itself "as will" has to be distinguished from the world "as imagination" as contemplated subjectively by the observer. This latter world exists only in our consciousness, while the world as will actually exists by the will proper. Unfortunately, this will proper is, in the opinion of Schopenhauer, obstinate, blind, impetuous, without intelligence and therefore senseless, and the world in itself is bad. This is the philosophical motivation of what is popularly called Schopenhauer's pessimism (*q.v.*). The only possible escape is contemplation as far as we are able to abstract from will. Then at least freedom is intelligible. Thus, Schopenhauer comes near to the concepts of Buddhism since, like the Buddhists, Schopenhauer believes that the destruction of desire and activity can assuage the will. Always the total amount of pain caused by will will be greater than the amount of pleasure for which the will actually strives and thus, will has to be annihilated by conscious contemplation. This conscious contemplation, human intelligence in itself, like everything else in the world, was also created by the meaningless will, which in this way had produced the means to overcome itself.

These ideas are far too complicated and too esoteric to explain the popular success of Schopenhauer's philosophy throughout the 19th century. This success can be traced to Schopenhauer's style, which is of a rare clarity and even beauty, in contrast to the professional, highly involved idiom of almost all other German philosophers, with the exception of Nietzsche (*q.v.*). Schopenhauer objected to German school philosophy, its style, and way of expressions, and particularly admired the much more lucid French and English philosophy of the 18th and 19th centuries.

Schrödinger (*shrē'dĭng-ẽr*), ERWIN, physicist, born in Vienna, Austria, Aug. 12, 1887; died there, Jan. 4, 1961. He taught at universities in Vienna, Stuttgart, Breslau, and Zurich before he became director (1927) of the department of technical physics at the Univ. of Berlin. Upon the rise of Nazism, he left Berlin in 1933 and became a fellow at Magdalen Coll., Oxford, England. In the same year he shared the Nobel Prize in physics with Paul A. M. Dirac (*q.v.*) "for the discovery of new fertile forms of the atomic theory." He also won recognition for his work on the theory of matter, wave mechanics, the physical theory of color, and the quantum theory. He taught (1936-38) at the Univ. of Graz, in Austria, until the Nazis gained control there, and he taught (1940-56) at the Dublin Inst. for Advanced Studies. He resumed teaching at the Univ. of Vienna in 1956 and represented Austria in the International Atomic Energy Agency. Among his books are "What Is Life?" (1944), "Expanding Universes" (1956), and "Science Theory and Man" (1957).

Schubert (*shōō'bẽrt*), FRANZ PETER, composer, born in Lichtenthal, a suburb of Vienna, Austria, Jan. 31, 1797; died Nov. 19, 1828. After initial voice and violin instruction through his father, a parish schoolmaster and a moderately good musician, and piano lessons with one of his brothers, he received training with the kapellmeister of the Lichtenthal church and at the age of 11 he was admitted (1808) to the Imperial Konvikt, the leading music school of Vienna, which trained choristers for the court chapel. As assistant to his father (1814-17), he got excellent experience in the school orchestra and sometimes substituted as conductor. In addition, Schubert was a member, playing the viola, of his family quartet, which met on Sundays and holidays.

He revealed an early genius in composition and at the age of 13 produced a 32-page four-hand piano fantasie (dated Apr. 8 to May 1, 1810). He tried out a great deal of chamber music on the family quartet and composed his first symphony in October 1813. By the end of 1815,

Courtesy Bettmann Archive, N. Y.

FRANZ SCHUBERT AT THE PIANO

Drawing by Moritz von Schwind (1804-1871)

he had completed three symphonies, four operas, three masses, a cantata, and some 200 songs, in addition to unknown quantities of chamber music and piano pieces. This was an excellent indication of his future activity, for Schubert proved an incredibly voluminous composer of great variety.

His position at his father's parish school helped him to pay for counterpoint lessons from the eminent Italian composer Antonio Salieri. About 1815 his great friend Josef von Spaun introduced him to a wealthy law student, Franz von Schober who invited Schubert to live with him so that the composer could devote all of his time to composition. To this period belong two of his finest songs, *"Gretchen am Spinnrade,"* from Goethe's "Faust," and *"Der Erlkönig,"* and perhaps also *"Heidenröslein."* He also wrote three ceremonial cantatas, the "Fourth (or Tragic) Symphony" in C minor, and the "Fifth Symphony" in B flat major, as well as about 100 songs.

He was now beginning to receive recognition in private circles. The great dramatic baritone Michael Vogl performed his songs in Viennese salons, and Leopold von Sonnleithner, the wealthy burger and cofounder of the Gesellschaft der Musikfreunde, asked him to perform at musical parties. Not until 1818, however, was one of his works performed in a public concert. Schubert spent the summer of 1819 as music master to the family of Count Johann Esterházy, a Hungarian nobleman who spent part of the year in Vienna and the other on his estate at Zseliz. Returning to Vienna in November, Schubert went to live with the poet Johann Mayrhofer. At about this time, he composed the piano quintet "The Trout" and the piano fantasy *"Der Wanderer."* The opera *"Die Zwillingsbrüder"* and the melodrama *"Die Zauberharfe"* met, like most of his operas, with no great success; they were not sufficiently dramatic in character and involved numerous technical difficulties.

Meanwhile, Schubert was the victim of what has been termed disgraceful neglect on the part of the Viennese publishers, who would not touch his work because he was unknown. Von Sonnleithner finally persuaded the publisher Diabelli to print a few songs on a commission basis in 1821. Thus, *"Der Erlkönig"* was issued as Schubert's Opus 1. From time to time, the publishers agreed to publish a few of his works, but he was always wretchedly paid. The so-called *"Müllerlieder"*, from the song cycle *"Die Schöne Müllerin,"* were sung by by Karl Freiherr von Schönstein about 1823, also, and in 1824 Schubert wrote his magnificent octet. To this period also belong perhaps the greatest of his orchestral works, the "Unfinished Symphony" in B minor, his Mass in A flat, and some of his best songs. On an extended trip to Upper Austria in 1825 he wrote the "Songs from Sir Walter Scott" and two piano sonatas, in A minor and C major respectively. The "Sonata in A Minor" was sold for $100, more than he had ever received before.

He became conductor of the Vienna Opera for a short time in 1826 but left because he would not change a vocal piece to suit the soloist. In 1828, not long before his death, he gave the first and only public concert of his own compositions. In this final period, he wrote a trio in B flat major, two string quartets, one in D minor (called "Death and the Maiden") and the other in G major, his famous "Rondeau Brillant" for piano and violin, a great symphony in C major, and a Mass in E flat. It seems probable that most of the settings for his famous song cycles, the *"Winterreise"* songs and the *"Schwanengesang,"* were also completed at this time.

Although Schubert is now considered one of the greatest song writers of all time, and the beauty of his songs (*Lieder*) has never been excelled, the great bulk of manuscript which he left at his death lay idle and covered with dust for decades. Schumann by accident discovered the "C Major Symphony" and took it back to Leipzig where it was performed with great success by Mendelssohn in 1838. But it was not until 1867 that Sir George Grove and Sir Arthur Sullivan made a special trip to Vienna and gave such widespread publicity to their findings that, ultimately, a definitive edition (40 vols., 1885-97) of Schubert's work was published.

In the short period of about 15 years, Schubert created an astoundingly great number of works, broad in variety and rich in beauty. However great his orchestral compositions may be, the greatest contribution he has left to posterity are his songs. He must be considered the creator of the *Lied,* which, in his true romantic spirit and sincerest musicianship, he has given all its richness of mood and expression. Whether in single songs or in the cycles, whether in the pure melody of a folksong or following the fantastic, tragic mood of a poet's words, it is always melodic imagination which characterizes Schubert's songs.

Schuman (*shōō'mạn*), WILLIAM HOWARD, composer, born in New York City, Aug. 4, 1910. Schuman was (1935-45) a member of the music department of Sarah Lawrence Coll., Bronxville, N.Y.; while still in his 20's he established a reputation as an outstanding young American composer. His cantata "A Free Song" won him the first Pulitzer Prize in music in 1943. He has written symphonies, choral works, strong quartets, and orchestral music. He became president of the Juilliard School of Music (N.Y.C.) in 1945.

Schumann (*shōō'män*), CLARA, pianist, born CLARA JOSEPHINE WIECK in Leipzig, Germany, Sept. 13, 1819; died in Frankfurt-on-the-Main, May 20, 1896. Although she is remembered chiefly as the wife of the great German composer Robert Schumann, to whom she was married in 1840, Clara Schumann was a noted musician in her own right. Her piano performances of the works of her husband and of other composers won her the enthusiastic approval of musical circles, and it was she who edited and published the first complete collection of her husband's work. Some years after Schumann's death she accepted an appointment as teacher of music in the Frankfort conservatory, and she taught there until shortly before her death.

Schumann, ROBERT, composer and critic, born in Zwickau, Germany, June 8, 1810; died in Endenich, Germany, July 29, 1856. Though he had planned to be a lawyer, Schumann early turned to music, studying piano with Friedrich Wieck. His hands became crippled, however, as a result of an experiment to increase their playing powers, and he turned to composition and music criticism. He founded (1834) the journal, *Neue Zeitschrift für Musiḳ* (*New Magazine for Music*), an enterprise on which he worked until 1844. He married Clara Wieck in 1840, despite her father's opposition to the match (see *Schumann, Clara*). Schumann, foremost of the romanticists, wrote many lovely songs, among them the cycles *"Dichterliebe"* and *"Frauenliebe und Leben,"* symphonies (the best-known being the so-called "Spring Symphony" and the "Rhenish Symphony), concertos, overtures, and chamber music. His works for the piano (*e.g., "Papillons," "Kinderscenen," "Davidsbündlertänze"*) perhaps best express the depth of feeling, sensitivity, and dramatic conception with which he endowed his music. Two years before his death, Schumann was committed to an institution for the care of the mentally ill, and it was there that he died.

ROBERT SCHUMANN

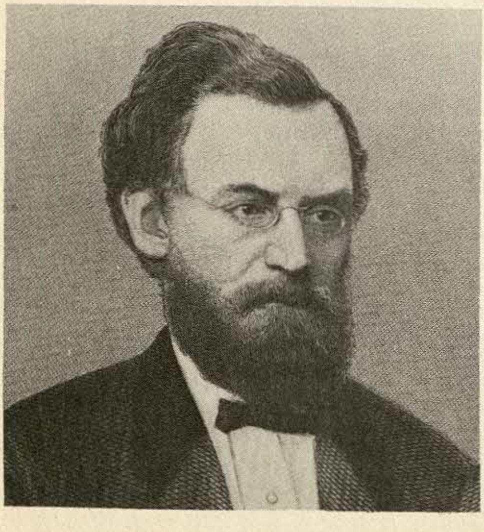
Schumann-Heink (*shōō'män-hīnḳ*), ERNESTINE, contralto, born at Lieben, near Prague, Bohemia, June 15, 1861; died in Hollywood, Calif., Nov. 17, 1936. Of Austrian-Czech parentage, she studied music at Graz, and made her debut at Dresden in 1878. In that city she sang with marked success for four years, and in 1883 she became associated with the Hamburg Municipal Opera. She sang with much success in the leading cities of Canada and the U.S., where she toured in 1898, and several times afterward. Her leading roles were as *Azucena* in *"Il Trovatore,"* the *First Norn* in "The Ring of the Nibelungen," and as *Ortrud* in Wagner's "Lohengrin." She appeared at the Metropolitan Opera House until 1932. Her voice was considered one of the most beautiful of its range ever heard.

Schuman Plan (*shōō'mạn plăn*) or EUROPEAN COAL AND STEEL COMMUNITY, an arrangement by which a common market was established for the coal and steel resources of Belgium, France, Germany, Italy, Luxemburg, and The Netherlands. Suggested by Robert Schuman, of France, in May 1950, the plan was ratified by participating countries in a treaty signed in April 1951. An organization to administer the terms of the treaty was established in August 1952. Accordingly, trade in coal; iron, and steel between member nations is being facilitated by the removal of customs duties, quantitative restrictions, double pricing, discriminatory freight rates, and currency restrictions. The community served as a precedent for two similar plans—the European Economic Community and the European Atomic Energy Community (Euratom), both instituted in January 1958. Some of the administrative machinery of the three communities was later integrated, but the High Authority of the Coal and Steel Community, its executive organ, continued to operate as a separate body.

Schurman (*shŏŏr'mạn*), JACOB GOULD, educator, born at Freetown, Prince Edward Island, May 22, 1854; died Aug. 12, 1942. He studied at Acadia Coll., Nova Scotia, and at the Univ. of London, and was granted a degree by the latter in 1877. Subsequently he studied at the German universities of Berlin, Heidelberg, and Göttingen, and in 1880 was made professor of English literature at Acadia Coll. In 1882 he became professor of English literature and philosophy at Dalhousie Coll., and remained there until 1886, when he was made professor of philosophy at Cornell Univ. In 1892 he succeeded Charles Kendall Adams as president of Cornell Univ., in which position he remained until 1920. In 1899 he became chairman of the first educational commission in the Philippine Islands. He was U.S. minister to Greece and Montenegro (1912-13), U.S. ambassador to China (1921-25) and to Germany (1925-30). His influence as a teacher and writer on educational topics was extensive. Among his publications are "Ethical Import of Darwinism," "Agnosticism and Religion," "Kantian Ethics and the Ethics of Evolution," "Belief in God," and "Philippine Affairs."

Schurz (*sho͝orts*), CARL, soldier, legislator, and journalist, born in Liblar, Germany, Mar. 2, 1829; died May 14, 1906. He studied at Bonn until 1848 and the following year took part in the revolution. After engaging in the unsuccessful defense of Rastadt, a fortified town of Baden, he was compelled to flee to Switzerland. He came to the U.S. in 1852, residing first at Philadelphia, but later settled in Watertown, Wis. He established a successful law practice at Milwaukee in 1859, where he became prominent as a leader among the Germans, and was closely identified with the organization of the Republican party. In 1860 he supported Lincoln, who appointed him U.S. minister to Spain in 1861, but he resigned to enter the army. He was made brigadier general of volunteers in 1862, and the following year became major general, commanding in the Second Battle of Bull Run, Chancellorsville, Gettysburg, and Chattanooga.

CARL SCHURZ



Schurz settled in St. Louis soon after the war, where he edited the *Westliche Post* and in 1869 he was made U.S. Senator. In 1872 he supported Horace Greeley for President, moved to New York in 1875, and in 1876 made an active canvass for Rutherford B. Hayes, who appointed him Secretary of the Interior. He edited the New York *Evening Post* from 1881 to 1883, and the following year supported President Cleveland on the issue of civil service reform. In 1896 he campaigned for McKinley on the issue of a single gold standard, and in 1900 supported W.J. Bryan because of his opposition to the war policy of the Republican party. Schurz was noted particularly for his independence in political discussions. He wrote one of the best biographies of Henry Clay. His speeches include "Abolition of Slavery as a War Measure," "Irrepressible Conflict," and "Eulogy on Charles Sumner."

Schuyler (*skī′lẽr*), PHILIP JOHN, soldier, born in Albany, N.Y., Nov. 22, 1733; died there Nov. 18, 1804. His father left to him a large estate, much of which he turned to good account in aiding the American colonies. From 1755 to 1758 he served in the British army against the French, and was promoted to the rank of major. He sat as a delegate in the Continental Congress at Philadelphia in 1775, and was made one of the four major generals first appointed to serve in the Revolutionary army. Immediately he proceeded to Ticonderoga with the object of invading Canada, but poor health obliged him to return to Albany and give up his command to Gen. Montgomery, while he discharged the duties of commissary general. After serving as a representative in Congress, in 1777, he became chief of military in Pennsylvania, and subsequently was given command of the Northern Department. He was present when Burgoyne surrendered at Saratoga, assisting Gen. Gates in making necessary arrangements, but in 1779 he resigned his command and served as a member of Congress. He was elected U.S. Senator from New York in 1789 and again in 1797. Schuyler was a trusted friend and adviser of Washington.

Schuylkill (*sko͞ol′kĭl*), a river in Pennsylvania, the largest tributary of the Delaware. It rises in Schuylkill County, near Pottsville, and, after a course of 130 m. toward the southeast, enters the Delaware at Philadelphia. The Schuylkill flows through a rich mining and agricultural country, supplies water power, and is one of the most beautiful features of Fairmount Park, Philadelphia. Among the cities on its banks are

Philadelphia, Reading, Norristown, and Pottsville.

Schwab (*shwŏb*), CHARLES M., capitalist, born in Williamsburg, Pa., Feb. 18, 1862; died Sept. 18, 1939. He became associated with the Edgar Thompson Steel Works as a stake driver, was made assistant manager in 1881. He became president of the Carnegie Steel Co. in 1897. He was president of the U.S. Steel Corp. (1901-03), of the Bethlehem Steel Corp. (1903-13), and chairman of the latter's board from 1913 till his death. In 1918 he was appointed director general of the U.S. Shipping Board Emergency Fleet Corp. He held directorships in banks, life insurance companies, and financial institutions of various kinds. Having amassed a vast fortune, he contributed liberally to charities and education.

Schwanthaler (*shvän'tä-lẽr*), LUDWIG MICHAEL, sculptor, born at Munich, Germany, Aug. 26, 1802; died Nov. 2, 1848. He studied sculpturing under his father and at the Acad. of Munich, where he was made professor in 1835. For some time he studied and worked in Rome. His monuments include those of Goethe at Frankfort, one of Mozart at Salzburg, and one to Jean Paul at Bayreuth.

Schwarz (*shvärtz*), BERTHOLD, a Franciscan friar, born in Freiburg, Germany, in 1300, said to have invented gunpowder. Interested in alchemy and chemistry, he is supposed to have discovered the explosive power of a mixture of saltpeter, sulphur, and mercury, or, as another story relates, a mixture of saltpeter, sulphur, lead, and oil.

Schwarzenberg Family, one of the oldest families in Franconia. Among the more important members of the family are: Adam (born 1587; died 1641), prime minister to George-Wilhelm, the Elector of Brandenburg, and an all-powerful figure during the Thirty Years' War (1618-48). He worked against the elector by promoting an alliance with Austria, and as a result was divested of his power and imprisoned in the fortress at Spandau, Prussia, where he died.

Karl Philip (born 1771; died 1820); trained as a soldier, he served with great distinction during the Napoleonic Wars, being appointed Austrian ambassador to Paris in 1809. He is credited with having arranged the marriage between Maria Louisa and Napoleon, and, in 1813, at Napoleon's request, he was placed at the head of the Austrian army, with the rank of field marshal. When Austria joined Russia and Prussia in the war against France, Karl Philip took part in the campaign against Napoleon and led the victorious allied armies into Paris.

Schwatka (*shwŏt'ka̤*), FREDERICK, arctic explorer, born in Galena, Ill., Sept. 29, 1849; died in Portland, Ore., Nov. 2, 1892. He was graduated from West Point Military Acad. in 1871 and until 1877 served as lieutenant of cavalry. He was made commander of an expedition to King William's Land in 1878. His company discovered the remains of Sir John Franklin's party and secured valuable information regarding its adventures. After many hardships and a sledge journey of 3,250 m., the party returned to the U.S. in 1880. In 1884 he explored the course of the Yukon in Alaska and had charge of an expedition sent by the New York *Times* into Alaska in 1886, when he ascended Mt. St. Elias to a height of 7,200 ft. In 1889 he conducted an expedition to study the remains of cliff and cave dwellers and of the Aztecs in Mexico. In 1891 he made another expedition to Alaska. Among the honors bestowed upon him are medals from the Imperial Geographical Society of Russia and the Geographical Society of Paris. He wrote "Nimrod of the North," "Along Alaska's Great River," and "Children of the Cold."

Schweinfurth (*shvīn'fo͝ort*), GEORG AUGUST, German explorer and naturalist, born in Riga, Russia, Dec. 29, 1836; died Sept. 20, 1925. He studied at Riga and Heidelberg, and conducted scientific excursions to study botany in France, Russia, and Italy. Between 1864 and 1871 he made three tours to Egypt, where he studied the flora and fauna of the Nile basin. He made extended explorations of the oases in the Libyan Desert from 1873 to 1875. In the latter year he was appointed by the Khedive of Egypt as director of the Cairo Museum of Natural History. From 1876 to 1878 he made explorations of the region between the Red Sea and the Nile, explored the island of Scotia in 1881, and subsequently promoted German colonization in the equatorial regions of Africa. He sent many valuable natural-history collections to the National Museum of Germany. His writings include "In the Heart of Africa."

Schweitzer (*shvī'tsẽr*), ALBERT, physician, musician, theologian, philosopher, born in Upper Alsace, Jan. 14, 1875. He entered the Univ. of Strasbourg at the age of 18. Schweitzer received doctorates for his work in three fields: religion, philosophy, and medicine. He is an acknowledged authority in the field of music, particularly the work of Johann Sebastian Bach (*q.v.*), and is a master of the art of organ building and playing. He was awarded the Nobel Peace Prize in 1952.

In 1905 Dr. Schweitzer determined to devote his life to medical missionary work in Equatorial Africa and spent the next six years preparing himself in medicine and surgery. In 1913, with the assistance of his wife (née Hélène Bresslau, died in 1957), whom he married in 1912, he established a hospital at Lambaréné on the Ogowe River in French Equatorial Africa. He equipped and maintained this hospital through lectures and recitals, later supplemented by grants from foundations and patrons.

Among his important published works are "The Religious Philosophy of Kant" (his doctoral thesis, 1899), "The Mystery of the Kingdom of God" (a collection of earlier works, 1914), "The Quest of the Historical Jesus" (1911), "J. S. Bach" (1911), "The Decay and the Restoration of Civilization" and "Civilization and Ethics" (1923), "Out of My Life and Thought" (1933), and "Mysticism of Paul the Apostle" (1955).

In his religious outlook, Schweitzer has expressed unorthodox theories, but his humanitarian thought and actions have their source in a basic "reverence for life," by which he means the universal acceptance of ethical standards and regard for life.

Schwerin (*shvâ-rēn′*), a city in Germany, the capital of Schwerin district, on Schwerin Lake, 60 m. E. of Hamburg. It is the trade center of an agricultural region noted for its dairy products. It is the site of Mecklenburg state conservatory. The first mention of Schwerin (1018) is as a Wendish settlement. As capital of the county of Schwerin it passed (1358) to Mecklenburg. It was the capital of Mecklenburg-Schwerin (1621-1934) and of Mecklenburg until the state was dissolved in 1952. Population, *ca.* 95,000.

Sciatica (*sī-ăt′ĭ-ḳȧ*), a condition characterized by neuralgic pain along the course of the great sciatic nerve (*q.v.*). Formerly thought to be caused usually by exposure to cold and wet, it is now known to be caused frequently by pressure on the roots of the sciatic nerve as they come off the spinal cord between the vertebrae due to damage or displacement of the cartilage disk or cushion between the vertebrae. Obscure inflammation of the sciatic nerve trunk alone may cause the symptoms of sciatica. In addition to pain there are numbness and tingling, tenderness along the course of the nerve, and eventually wasting of the muscles supplied by the nerve, especially of the calf and foot, resulting in a commonly seen condition of foot drop. Modern treatment consists of bed rest, vitamin B therapy, and spinal surgery if the cause is proved to be damage to the spine.

Sciatic Nerve (*sī-ăt′ĭḳ nẽrv*), largest nerve trunk of the human body, arising from the lower part of the spinal cord. It passes out backward through the pelvis and down on the inner side of the leg, branching out to supply the whole leg and foot with sensory and motor capacity.

Science (*sī′ęns*), from the Latin *scire* meaning "to know," and hence, any form of organized knowledge. In common usage, however, the word denotes only that aspect of learning which represents a systematic accumulation of knowledge pertaining to nature or the operation of general laws, in which sense the term is used as an abbreviation for "natural science." The beginnings of science are probably to be found in man's observations of his environment on the earth. As an element of regularity was seen in the repetition of certain natural occurrences, man formulated theories to explain these phenomena. Although the mythological, anthropomorphic explanations adduced by primitive men are no longer credited, they contain within themselves the essential germ of science, namely, an attempt to classify knowledge with reference to kind as well as to cause. In the early days of rational history, man garnered a considerable amount of knowledge which he correlated in terms of manlike deities who stalked through heaven and earth, causing the sun to move while the soil gave forth its bounty. Further observation of natural phenomena, however, demonstrated that primitive mythology was inadequate to explain all the realities of nature.

The first scientific awakening probably resulted from astronomical study, which, over a space of many centuries, revealed that the earth, far from being the center of the universe, is but a small dependent body within the orbit of a minor star, *i.e.,* the sun. The process of stretching man's knowledge beyond the confines of his immediate environment paved the way for further observation of phenomena as well as for an expanded and more sophisticated cosmology in which the universe was no longer made subject to the wisdom of a Jupiter or Apollo.

With man's curiosity aroused, it was but a short step to the study and analysis of the matter of which he is composed and with which he is surrounded. Charms and incantations were not always reliable in curing the ills of the body, and even among the ancient Greeks the rational practice of medical science made some headway. Lacking sufficient data, Greek scientists often went astray in formulating scientific laws, but in deductive reasoning they found a method that has proved indispensable to all later science. The highest stage to which deductive thought attained among the ancients was in the science of geometry, the study of spatial relations. Deduction is a mode of reasoning from the general to the particular; the inversion of this mode, known as induction, or reasoning from the particular to the general, was proposed by Aristotle, who suggested the value to science of conclusions based upon empirical observation.

Following the decline of culture in Greece, and later in Rome, science, together with all other manifestations of intellectual life, suffered an eclipse. The Dark Ages, which blanketed Europe in a shroud of ignorance, came to an end at about the 11th century A.D. when interest was revived in the classical writings of the early Greeks and Romans. For at least three centuries, however, the revival of thought remained limited to academic discourses, marked chiefly by the profound but unfruitful speculations of the scholastics (see *Scholasticism*). Without recourse to investigation, the scholastics or schoolmen sought authority for all intellectual speculation in the classic writings of the masters. Facts as well as opinions were considered reliably verified if only they were to be found in the works of Plato or Aristotle. However barren such a procedure may now seem, science evolved slowly from philosophic speculation into observation of natural phenomena. Later, by reintroducing the Greek distinction, those subjects beyond the competence of physical science were relegated to their own category (metaphysics), and science started once more to search the natural world for evidence in support of its beliefs.

In about the 15th century, the Renaissance began to cast new light upon ideas and learning. Scientists such as Leonardo da Vinci and Galileo attempted to discover evidence to substantiate theoretical conclusions. The scientific method as we know it today was further clarified and formalized by such later thinkers as Isaac Newton and Francis Bacon. They changed the role of science into one of explanation and interpretation instead of a mere vehicle for the dissemination of preconceived prejudice.

Modern science may be said to date from the discovery of scientific method. To investigate nature, however, it first became necessary to separate its many phases and classify these phases according to their basic character. Through the years, scientific classification has become increasingly complex as new facts of relationships have been discovered; moreover, the increasing volume of knowledge comprehended under each science has become too great for any individual to handle, and convenience has demanded that each field be further subdivided into smaller fields. Thus, from the original science of physics have grown such scientific specializations as electricity, physical chemistry, electronics, etc.

Another common division of science is made between the pure or theoretical, and the applied or practical phases. Thus, while the nature of the electron is a problem for pure scientific speculation, the product or result of this speculation is applied to such practical uses as the amplification of sound or the magnification of minute particles.

Biology, chemistry, geology, mineralogy, and physics are grouped under the term, natural sciences. The social sciences are those which deal with the social elements of human society, as for example, anthropology, economics, etc.

Because of the close relationship which has existed between modern science and systematic methods, the term has been applied to such unrelated fields as "scientific management" and "domestic science," presumably marked by methodical conduct.

Scilly (*sĭl'ĭ*), an island group belonging to the British Isles, situated 28 m. s.w. of Land's End, England. The group includes about 35 islands, but only six possess any importance, the others being formed largely of rocks. These islands belong to and form a part of Cornwall County. St. Mary's Island is the largest, having an area of 1,528 acres. The climate is moist and variable, and the principal products are vegetables and spring flowers. There are deposits of tin and granite, and the fisheries are of value. The islands were conquered by Athelstan in 938 and were granted to some monks, who formed settlements on the island of Tresco. Sir Francis Godolphin secured a lease of them from Queen Elizabeth and they remained in the possession of his family for 250 years, but are now part of the British Isles. Population, *ca.* 2,000.

Scimitar (*sĭm'ĭt-ẽr*), a curved sword used in the East, and well known in legends of the Orient. It is usually single-edged.

Scio (*sī'ō*), an island in the Aegean Sea, 7 m. off the coast of Asia Minor, 52 m. w. of Smyrna. It is 32 m. long, 17 m. wide, and has an area of 400 sq. m. The climate is favorable. Among the chief products are silk, cotton, wine, mastic, cereals, and many species of fruits. Horses, cattle, swine, and sheep are raised. It has valuable fisheries. The island was taken by the Persians, 494 B.C.; by the Genoese, 1346; and by the Turks, 1566. In 1822 many Sciotes were massacred in a revolt against Turkey. The island was awarded to Greece in 1913, following the Balkan War. Scio contends for the honor of being the birthplace of Homer. Kastro (population, *ca.* 19,000) is the capital. Population of the island, *ca.* 75,000.

Scioto River (*sī-ō'tō rĭv'ẽr*), a northern tributary of the Ohio, which rises in Auglaize County, western Ohio, and after a course of 285 m. toward the east and south flows into the Ohio River at Portsmouth. The Scioto Valley is fertile, producing large quantities of cereals, fruits, and livestock. The chief tributaries are the Whetstone and Derby.

Scipio Aemilianus (*sĭp'ĭ-ō ē-mĭl-ĭ-ăn'ŭs*), PUBLIUS CORNELIUS, called Africanus Minor, Roman general, born *ca.* 185 B.C.; died in 129 B.C. He was the son of the great conqueror of Macedonia, Lucius Aemilius Paullus, and was adopted by his kinsman, the eldest son of Publius Cornelius Scipio Africanus Major. From the latter he took the name Scipio. He accompanied his father at the great battle of Pydna (168 B.C.) which made northern Greece subject to Rome. In 151 B.C., he served as a military tribune in Spain. In the following year he was asked by the Carthaginians to settle a territorial dispute between them and the Numidian prince Massinissa. When Rome declared war on the Carthaginians at the beginning of the Third Punic War (149-146 B.C.), Scipio Aemilianus served with such distinction that two years later he was elected consul, although not of legal age. In supreme command of the besieging armies, he stormed Carthage in 146 B.C. and in pursuance of his orders leveled that city to the ground. It is said that as Scipio beheld the terrible destruction of Carthage he envisioned the future fate of Rome, recalling to mind a verse in the "Iliad":

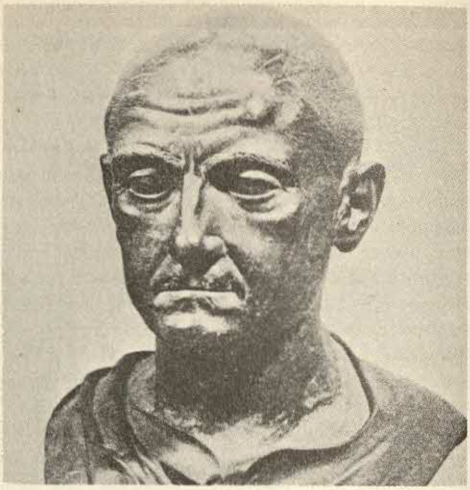
"The day shall come when sacred Troy shall perish,
And Priam and his people shall be slain."

On returning to Rome he was hailed as a conqueror and surnamed Africanus. He became censor in 142 B.C. and three years later accepted a mission to Egypt and Asia. In 134 B.C., when Roman operations in Spain were unsuccessful, he was again elected consul and after a siege of eight months conquered and sacked the city of Numantia, thus placing the province of Hither Spain under Roman dominion.

In political affairs he was much respected but was too moderate to be popular with either the senatorial or the popular party. He made many enemies by attempting to control the mounting luxury and lax morality in Rome and at one time was accused of high treason. He was particularly opposed to the revolutionary methods of the popular party and wanted to destroy the agrarian laws of Tiberius Gracchus. On the evening before he was to have delivered a speech against these measures, he died mysteriously, probably at the hands of Gracchi supporters. His wife, Sempronia, was a sister of Tiberius Gracchus and may have had something to do with his death.

A cultured gentleman and an excellent orator, as well as a soldier, he is said to have possessed all the antique Roman virtues and was highly spoken of by Cicero. He surrounded himself with outstanding scholars of his time, the philosopher, Panaetius, the poets, Lucilius and Terence, and the Greek historian, Polybius.

Scipio (*sĭp'ĭ-ō*), PUBLIUS CORNELIUS, called Africanus Major, Roman general, born *ca.* 234 B.C.; died 183 B.C. He is first mentioned in connection with the Second Punic War (218-201 B.C.) at the Battle of the Ticinus (218 B.C.), where it is said that he saved the life of his father, Publius Cornelius Scipio, the first Roman general to encounter Hannibal in battle. He soon became a military tribune and participated in the Battles of the Trebia (218 B.C.) and Cannae (216 B.C.), escaping after these disasters to muster the remaining Roman forces. Although under age, he was appointed aedile in 212 B.C. and in the following year elected proconsul, in command of the Roman army sent to Spain. At that time, the Carthaginians were in control of Southern Spain and had established their headquarters in Cartagena, an excellent harbor at the mouth of the Ebro River. Taking advantage of the fact that the three Carthaginian generals, Hasdrubal and Mago, brothers of Hannibal, and Hasdrubal, son of Gisgo, were engaged in quelling revolts in Africa, Scipio captured Cartagena and all its rich supplies of war materials in 210 B.C. He made many friends among the Spanish and gained control over several other cities, defeating Hannibal's brother Hasdrubal at Baecula on the upper Guadalquivir River in 209 B.C. His strategic victory at Ilipa in Andalusia in 206 B.C. drove the Carthaginian army finally out of Spain.



SCIPIO AFRICANUS MAJOR

Intending to strike at the city of Carthage in Africa, Scipio attempted to form an alliance with the Numidian princes Syphax and Massinissa, but failed, largely because the former was married to Sophonisba, daughter of Hasdrubal, son of Gisgo. After he was selected consul in charge of Sicily (205 B.C.), however, he pursued his plan to carry the war into Africa. In 204 B.C. he landed with a large invasion force near Utica and destroyed the combined forces of Syphax and the Carthaginians in the following year. On Oct. 19, 202 B.C., he defeated Hannibal in the Battle of Zama, temporarily terminating the wars between Rome and Carthage, which Hannibal now considered hopeless. The peace terms concluded at the end of the Second Punic War required Carthage to surrender Spain and her Mediterranean islands to Rome. Scipio was welcomed back to Rome in a triumphal ceremony and accorded the name of Africanus along with many other honors.

In 193 he served on a mission to settle disputes between Massinissa and the Carthaginians, and when the Romans declared war (190 B.C.) against Antiochus III of Syria, Scipio served as a legate under his brother Lucius, who was in command of the invading armies. Lucius won a decisive victory at Magnesia in the same year.

On their return to Rome, the two brothers were attacked by political enemies who instigated a prosecution against Lucius on the grounds that he had been bribed by Antiochus. Lucius was found guilty and his property was confiscated. In 185 B.C. Scipio was also accused of misappropriating funds received from Antiochus, but during the trial he aroused great popular sympathy by reminding the people of his victory at Zama, and the trial had to be halted. Later he withdrew from public life and retired to his country home at Liternum in Campania.

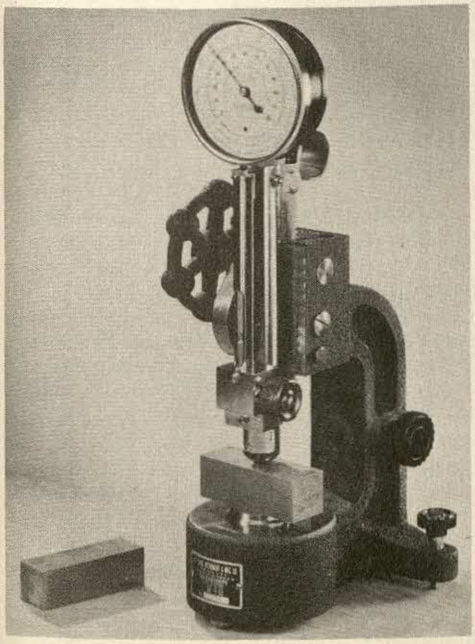
Scipio, considered one of the greatest Roman generals, also was an orator and a man of culture. A master of Greek, he wrote his memoirs in that language. His daughter, Cornelia (*q.v.*), became the mother of the Gracchi (see *Gracchus*).

Scirocco (*sĭ-rŏk′ō*). See *Sirocço.*

Scissorbill (*sĭz′ẽr-bĭl*). See *Skimmer.*

Sclerometer (*sklê-rŏm′ê-tẽr*), an instrument for measuring hardness of materials by the depth of the depression produced in the material when a diamond-tipped drill is rotated a predetermined number of times. The test is really an abrasion test, with softer materials undergoing greater abrasion than do the harder materials. The depth of the depression is measured with a micrometer. The scale of the sclerometer is arbitrary, but corundum, a hard material, has a value of about 1,000 on the scale.

Scleroscope (*sklē′rô-skōp*), an instrument for measuring and visually recording the hardness of materials by the fall of a diamond-tipped hammer. The hammer falls from a fixed height and rebounds to a height which determines the hardness of the material. The scale of the instrument is arbitrary, but a high-carbon steel gives a reading from 95-105 divisions on the scale.



Courtesy Shore Instrument & Mfg. Co., Jamaica, N. Y.

DIAL RECORDING SCLEROSCOPE

Sclerosis (*sklê-rō′sĭs*), in medicine, a disease of certain tissues, especially arteries, characterized by the hardening of the covering membranes. It represents a kind of calcification, frequently resulting from old age. Sclerosis of the liver, of the spinal cord, and of parts of the brain may also occur.

Scoliosis (*skō-lĭ-ō′sĭs*), a medical term meaning lateral (to the side) curvature of the spine. It may occur in any part of the spine and may vary from a slight to a severe deformity, either by itself, or as a part of a complex of spinal deformities including *lordosis* (exaggerated forward curvature with excessive backward protrusion of the hips) and *kyphosis* (exaggerated backward curvature, usually in the upper part of the spine between the shoulder blades, the extreme form being commonly known as "hunchback").

Usually scoliosis develops in infancy or childhood from such conditions as softening of the bones of the spine and ribs due to rickets (*q.v.*), from rheumatism or paralysis of spinal muscles with resultant poor support of the spinal column, and, most commonly, from simply faulty postural and physical training during the growth period. Other causes are diseases of the spinal bones (vertebrae) themselves, such as various bacterial infections, including tuberculosis. Other rare causes are certain congenital defects of bone structure, and sciatica (*q.v.*), with convexity of the spine toward the affected leg. *Static scoliosis* is that resulting from one leg being shorter than the other, such as may result from a fracture. Treatment of scoliosis, once the underlying cause is ascertained and cured, includes long and persistent use of postural exercises, special beds, specially built shoes, and in severe cases special back and shoulder braces and belts for variable lengths of time.

Scolopendra (*skŏl′ô-pĕn′drȧ*), a genus of chilopods. The centipedes belong to this classification.

Scone (*skōōn*), a town of Scotland, on the Tay River, 2 m. N. of Perth. It is celebrated for its monastery, first mentioned in the early part of the 10th century, in which the kings of Scotland from 1153 until 1458 were crowned. Population, *ca.* 2,500.

Scopas (*skō′păs*), one of the leading sculptors of Greece, born on the island of Paros; he lived in the first half of the 4th century B.C. With Praxiteles (*q.v.*) he was the founder of the later Attic school. His main works are represented in the reliefs from the pediments in the temple of

Athene Alea at Tegea in Arcadia. After the creation of this grandiose sculptural work he settled in Athens, later working on the reliefs of the Mausoleum of Halicarnassus in Asia Minor. Scopas' sculptures are distinguished mainly for the great pathos which characterizes all his heads. He achieves this expressiveness especially by the wide-opened eyes embedded into deep shadows and frequently open mouths, thus relieving the classical quietude by a more excited approach and concept of the human face and body.

Scopes Trial (*sḳōps trī'ạl*), a famous American trial involving the theory of evolution and the question of academic freedom. John T. Scopes (1901-), a public-school teacher, was convicted of breaking a Tennessee law, which expressly forbade the teaching of a "theory which denies the story of the Divine creation of man as taught in the Bible." At the trial in Dayton, Tenn., in July 1925, Clarence Darrow (*q.v.*) defended the teacher, while William Jennings Bryan (*q.v.*) assisted the prosecution. Scopes was fined $100, a conviction reversed by the state supreme court on technical grounds.

Scorbutus (*sḳôr-bū'tŭs*). See *Scurvy.*

Scoresby (*sḳōrz'bĭ*), WILLIAM, explorer, born near Whitby, England, Oct. 5, 1789; died Mar. 21, 1857. He was the son of a whaler and accompanied his father to Greenland during the summer, but studied at the Univ. of Edinburgh in winter. In 1876 he was the chief officer of the ship *Resolution,* with which he sailed to 81° 30′ N. lat., the most northerly point reached up to that time. He explored the eastern coast of Greenland in 1821 and the following year surveyed and chartered about 800 m. of the winding coasts. In 1856 he made a voyage to Australia for the purpose of studying terrestrial magnetism in that continent. He published: "Journal of a Voyage," "An Account of the Arctic Regions," and "Journal of a Voyage to Australia for Magnetical Research."

Scoria (*sḳō'rĭ-ȧ*), volcanic ashes and slag. When ejected by volcanoes as ashes, it falls as an accumulation of powdery deposits or pumice; when derived from a flow of lava, it is a porous ropy mass with a glassy texture. The composition of scoria varies, being chiefly silica accompanied by varying quantities of metallic oxides. The name is also given to the refuse from the melting of metals or the reduction of ores.

Scorpio (*sḳôr'pĭ-ō*), or SCORPIUS, the eighth sign of the zodiac. This constellation is now situated in the sign Sagittarius, owing to the precession of the equinoxes. It contains Antares, a bright red star, and on each side of it is a smaller star. See *Zodiac.*

Scorpion (*sḳôr'pĭ-ŭn*), the name of an extensive genus of insects, native to the warm climates of both hemispheres, belonging to the same family as the spiders. The body is elongated, usually from 2 to 6 in., and somewhat resembles that of small lobsters in shape. They have a long, narrow, flexible tail, which is capable of being curved over the back and terminates in a poisonous sting. Six broad segments are found in the abdomen and six narrow ones in the tail. The sting consists of a curved and sharp modification of the last segment. They are provided with 6, 8, or 12 eyes, and have eight legs and two large claws resembling those of the lobster. The scorpions frequent dark places during the day, usually seeking shelter under stones, but at night come out in search of food. It is not uncommon to find them in hiding under pillows, boots, and other objects in warm climates, where they are disliked and dreaded. Their sting, though painful and poisonous, is seldom, if ever, fatal to man.

Scorpions are found in abundance in Southern Asia and Europe, Northern Africa, Australia, and the tropical parts of America. The *black scorpion* has a body about 6 in. long. Its sting is very poisonous. Several small species are native to the southern part of the U.S. The so-called *rock scorpion* is a familiar kind. Another group of insects allied to them is the *book scorpions,* but they are smaller and do not possess the jointed tail common to the true scorpions. They live in or among books, where they subsist on minute insects that frequent such places. The true scorpions feed on spiders and insects. From 30 to 60 young are brought forth from eggs at a time and are carried on the back of the mother during early life.

Scorpion Fish (*fĭsh*), the name of several species of fishes of the gurnard family. The common scorpion fish of the Pacific coast, found off the shores of California and Mexico, is sold extensively on the market. It is a foot in length and has a brownish color, tinted with rosy and olive shades. Several species are found in the Mediterranean and off the Atlantic coast of Southern Europe, including the red and the spotted scorpion fishes.

Scorpion Fly (*flī*), the name of several insects related to the dragon flies, so called from the terminal segments of the abdomen being mobile and elongated. The outer segments are curved over the back similar to the tail in the true scorpion, and in some species a pair of forceps are attached to the last joint. When the insects are excited and irritated, the forceps are used as offensive and defensive weapons. These insects have four wings, through which many veins permeate, and the head is prolonged in the form of a beak. The larvae feed upon insects and dead animals, while the adults subsist largely on juices of plants. Many species are common to Canada and the U.S., including some wingless forms.

Scotch Terrier (*sḳŏtch tĕr'ĭ-ẽr*). See *Terrier.*

Courtesy British Information Services, N. Y.

SCOTTISH COUNTRYSIDE

Scotland (*skŏt′land*) is the northern part of the United Kingdom of Great Britain. Its border with England runs along the line of the River Tweed, the Cheviot Hills, the River Liddel, and the Solway Firth. Its eastern shores are washed by the North Sea, its northern and western shores by the Atlantic Ocean, and its southwesterly islands and peninsulas by St. Patrick's Channel and the Irish Sea. Its coastline is about 2,300 m. long, and, especially on the west, is marked by numerous deep inlets called firths and resembling the Norwegian fiords. Off the west coast, lie the 500 and more islands of the Inner and Outer Hebrides. Another island group, the Orkneys, lie 6¼ m. to the north of Duncansby Head on the northern mainland; 50 m. again to the north are the Shetland Isles. The area of Scotland, including islands and inland waters, is 30,410 sq. m.

Geographically, Scotland is divided into three well-marked regions: the Highlands, the Lowlands, and the Southern Uplands. The Highlands include the islands and that part of the mainland which lies north of the so-called "Highland Line" extending southwest from Perth to Ben Lomond (the Gaelic word *Ben* means "mountain"). Here the land is mountainous, bare and rugged, and there are numerous rivers and lakes or *lochs*. The highest mountain in Scotland and the British Isles is Ben Nevis (4,406 ft.) at the southwestern end of Glenmore. Glenmore, the "Great Glen," running southwest from the Moray Firth to Loch Linnhe, divides the Highlands into two regions. It is a narrow valley containing three lakes (Loch Ness, Loch Oich, and Loch Lochy), which are connected by the Caledonian Canal so as to offer through-passage to small vessels. South of Glenmore, the two chief mountain ranges are the Monadhliath Hills and the higher Grampian Range. The eastern coastal section in this part of the Highlands is flatter and more fertile than the rest of the region, and some of the towns (notably Dundee, Perth, and Aberdeen) are of considerable size, and have important industries. Agriculture also flourishes here, especially in the plain of Strathmore near Perth. It would, in fact, be fair to say that geographically and industrially, and also historically, this section has more in common with the Lowlands than with the rest of the Highland region. North of Glenmore, the mountain ridges are generally lower than in the southern Highlands, but the land is even wilder and barer. A certain monotony in the landscape contrasts with the breathtaking beauty of the southern Highlands, though here, too, rugged peaks and steep valleys break the uniformity of heather-covered upland to produce a moving impression of natural grandeur.

The central Lowlands lie in a broad rift valley running northeast and southwest, some 30 m. in breadth, and broken by occasional lines of low hills such as the Pentlands and the Campsie Hills. The land here is very fertile. It is also rich in minerals, and since the industrial revolution agriculture has given up much ground to iron and coal mining, and to the industries which depend on these minerals. Scotland's two greatest cities, Edinburgh and Glasgow, are situated respectively on the east and west of the Lowland plain. The scenery, where it has not been spoiled by industrialization, is rural and attractive. Since the Lowlands have always been the richest part of Scotland, and the Scottish kings always had their residences there, it is not surprising that most of Scotland's best architecture is found there. Among the finest buildings are the castle-fortresses of Edinburgh and Stirling, the palaces of Holyrood and Linlithgow, and such pleasant examples of domestic architecture as Bonaly Tower near Edinburgh.

Between the Lowlands and the English border lie the pastoral Southern Uplands, a country of bare rolling hills and fertile wooded valleys. This is the famed Border Country, the ancient battleground of Anglo-Scottish wars and the scene of many of Sir Walter Scott's novels and poems, and many of the old ballads collected by Bishop Percy in his "Reliques." The remains of old monastic houses ruined by the Reformation are a frequent sight in the valleys.

CLIMATE. The climate of Scotland is somewhat colder than that of England, owing to its more northerly situation, and the generally greater elevation of the land, but the warm waters of the Gulf Stream save it from excessive cold. The mean winter temperature is around 35° F., that of summer around 58°. The annual rainfall, especially in the west, is heavier than in any other part of the United Kingdom. In 1944 it was estimated at 53.2 in. In spite of cold and wet, however, the climate of Scotland is healthy and bracing.

LAKES AND RIVERS. Scotland's famous salmon and trout fishing is of great importance to the tourist trade since it attracts many anglers. There are also some commercial fisheries on inland waters. Among the best-known lakes are Loch Lomond, Loch Katrine, Loch Maree, and Loch Leven. The rivers include the Don, the Dee, the Tweed, the Clyde, and the Spey.

AGRICULTURE. Scotland's largest industry is agriculture. In the Highlands the soil is generally poor and thin, and the farmer earns a bare livelihood, dependent mainly on hill sheep. Elsewhere the land is of better quality, and Scottish farmers are highly skilled. Scottish breeds of sheep and cattle are known all over the world—for instance, Aberdeen, Ayrshire, and Galloway shorthorn cattle, and Shetland and Cheviot sheep. Clydesdale draft-horses and Shetland ponies are also in demand for export.

FISHERIES. Scotland's river fish have already been mentioned. Salt-water fish, especially herring, in which the surrounding seas abound, are economically even more important, and many small towns and villages on the coast depend on the skill of native fishermen. The herring industry suffered a depression after World War I, however, partly because foreign markets were lost, and partly because of competition from trawler fleets based on English ports. Aberdeen is the principal center of the Scottish fishing industry, and there are subsidiary centers at Mallaig on the west coast and Lerwick in the Shetlands.

INDUSTRIES. The principal industries are located in the Lowlands, and include mining, engineering, manufacture, shipbuilding, printing and publishing, agriculture, and fishing. The most important minerals mined are coal and iron. The output of iron ore has declined since the second decade of the 20th century, falling from 591,600 tons in 1913 to 22,300 in 1937. Coal-mining remains an important industry. Other minerals mined or quarried include granite and other kinds of stone, shale (for oil), and lead.

Shipbuilding is one of Scotland's leading industries, but it suffered a major disaster from disarmament and economic conditions during the years between World Wars I and II. The number employed in the Clyde's famous shipyards fell from 31,344 in 1930 to 17,913 in 1935. It rose again as preparedness programs got under way in the late 1930s, and all the yards were fully employed during World War II. Scotland also has extensive engineering and iron and steel works, but these, too, suffered from economic depression between the two World Wars.

Textile manufacture has been established in Scotland since early times, and flourished particularly in the first half of the 19th century. It stagnated after that except for jute—and that suffered from Indian competition in the 20th century. After World War I there was a certain expansion in manufacture of some textiles, and rayon manufacture was established. This, along with the introduction of other light industries, helped to take up some of the slack left by the decline of the heavy industries. It should be noted that wool and hosiery are the chief industries of the predominantly rural Southern Uplands, and that woolen goods and textiles—especially the famous homespun tweeds—are produced in the Highlands and the islands.

Of the other Scottish products, the most famous is certainly whiskey. Scottish ales and beers, though less well-known, are of high quality. Industries connected with the book trade are important—paper manufacture, printing, publishing and book-binding. Boot and shoe, leather goods, foodstuffs (especially jam, marmalade, and confectionery), and chemical manufacture all increased between the two World Wars, and Scotland also had its share in the new industries (aircraft manufacture, for instance) dependent on the armament program. The tourist trade is important, especially for the poor but beautiful regions of the Highlands.

COMMUNICATIONS. Southern Scotland is well served by roads and railways. Communications in the Highlands are less satisfactory, and though the main highways are good, secondary and other roads are frequently in poor condition. Four canals supplement the road and railway service. Glasgow, Greenock, and Leith are the principal Scottish ports for oceangoing steamers. Communication with the islands is by steamer or, where possible, ferry, and by air.

POPULATION. The population of Scotland at the 1951 census was 5,095,969. About 80 per cent of the total live in the agricultural and industrial Lowlands. The population of the principal cities was as follows: Glasgow, 1,089,555; Edinburgh (the capital of Scotland), 466,770; Aberdeen, 182,741; Dundee, 177,333. The predominating racial element is Celtic, with lesser Teutonic and Scandinavian strains. The prosperity of southern Scotland in the 19th century attracted many immigrants, principally as industrial workers, from Ireland, and this immigration continues in the 20th century, although somewhat diminished. There has also been a small immigration from England and Wales and from the continent. In spite of immigration, and of a birth rate higher than that of the rest of the United Kingdom (17.7 in 1952), the population of Scotland shows a long-term decline. This trend is caused partly by a relatively high death rate (12.0 in 1952), but more directly by a large volume of emigration, both southward to England and Wales and overseas.

RELIGION. The dominant religious body in Scotland is the Church of Scotland (Presbyterian), which occupies the position of an established church. In 1843 a large body of ministers and communicants, separating themselves from the Church of Scotland, set up the Free Church, which once numbered over 500,000 members. After various struggles, the United Free Church rejoined the Church of Scotland; the joint church in 1951 had 1,273,027 members. A minority group of members of the Free Church retain the name, and because of being a minority are colloquially known as the Wee Free. The Roman Catholic Church is the next strongest religious body, with 748,463 members (1951), chiefly in the industrial areas and in remote island and Highland areas. The Episcopal Church had 108,502 members in 1951; and there are several smaller bodies, mostly Methodist and Presbyterian.

LANGUAGE. In the early Middle Ages, the language of Scotland was the Gaelic or Celtic tongue, although English was already in general use in the southeastern regions which had been settled by Anglian invaders. During the following centuries, the older language was steadily replaced by English, until by the middle of the 20th century Gaelic was spoken by less than 3 per cent of the people. The Scottish dialects of the English language are still marked by recognizable characteristics.

Courtesy British Information Services, N. Y.

SCOTLAND. VIEW OF EDINBURGH

LITERATURE. Much of the early writing of Scotland was in Latin—*e.g.*, St. Adamnan's life of St. Columba, written about 690. There was a medieval literature in the vernacular (called "Ynglis"), but little survives. The Gaelic literature also survives only scantily. Many of the famous folkballads were composed during the Middle Ages, but were not written down until the 15th century or later, so that it is difficult to date them. John Barbour's narrative poem "Bruce" appeared toward the end of the 14th century, Harry the Minstrel's "Wallace" late in the 15th. The early 15th century saw Andrew of Wyntoun's "Oryginale Cronykil of Scotland." The 15th and 16th centuries are the golden age of Scottish literature. To them belong the writings of the court poets, led by James I with his dream-poem "The Kingis Quair [Book]." The greatest of these court poets are William Dunbar, Gavin Douglas, Robert Henryson, and Sir David Lyndsay. The satirical poems of Sir Richard Maitland were published in 1560, followed by the pastoral and amorous verse of Alexander Scott. Other writers of the period include Alexander Montgomery, William Fowler, Alexander Arbuthnot, and John Rolland. Among the leading writers of the Reformation period are John Knox, James VI (who became James I of England), and the historian Robert Lindesay of Pitscottie.

For a century after the union of the Crowns in 1603, Scottish literature maintained its distinct character. Many songs, ballads, and other writings were published, and it was an age notable in Scotland, as elsewhere, for ferocious religious pamphleteering. William Drummond of Hawthornden (1585-1649), poet and political writer, belongs to this period, as does Allan Ramsay

Courtesy British Information Services, N. Y.

MELROSE ABBEY, SCOTLAND

Built in 1136, the structure was wrecked by warfare in the 16th century

(1686-1758), author of the dramatic pastoral "The Gentle Shepherd." After the union of the Parliaments in 1707, Scottish literature blends with that of England (see *English Literature*). But Scotland continued to produce notable writers, among them Sir Walter Scott, Robert Burns, James Hogg, Tobias Smollett, Robert Louis Stevenson, James M. Barrie, the economist Adam Smith, and David Hume (*qq.v.*).

GOVERNMENT. Scotland forms an integral part of the United Kingdom (see *Great Britain*), and is represented by 74 members in the House of Commons and by 16 Lords; other Scottish peers sit in the House of Lords as peers of the United Kingdom. At the time of the union in 1707, the judicial system and the Church of Scotland were left intact. There are two high courts, the court of session and the high court of justiciary. Lesser courts are the sheriff courts and the courts of justices of the peace. Since the *Local Government (Scotland) Act* of 1929, the principal local authorities have been the 33 Scottish county councils and the town councils of burghs with populations of 20,000 or more. The other local authorities, with lesser powers and duties, are the town councils of small burghs and the district councils; the old parish councils and some other bodies were abolished by the Act of 1929.

The school-leaving age in Scotland is 15, and the general literacy rate is high. Secondary education is free for all who wish it. Scotland has four universities, at St. Andrews (founded in 1411), Glasgow (1450), Aberdeen (1494), and Edinburgh (1583). These universities are coeducational and independent of the government, although they receive government grants.

HISTORY. The early history of Scotland is the story of the union into one Scottish nation of four tribal kingdoms—the Picts, the Scots, the Angles, and the British. The first inhabitants, the Celts, were invaded in the 1st century, by the Romans, who called the country Caledonia (*q.v.*) and the people Caledonians. In the 4th century the Picts became dominant in the north, while the Scots, Irish colonizers, settled in the west and formed the kingdom of Dalriada. Anglian invaders took possession of the eastern region south of the Firth of Forth. Toward the end of the 8th century the Northmen began their invasions and successful conquest of the Shetlands, Orkneys, and Hebrides. In the 9th century a union of the Scots and Picts was effected; in 1018, Malcolm II attained the territory of Lothian, formerly part of Northumbria, by conquest, and under Duncan (1034-40) the kingdom was expanded to include the Scots, Picts, Angles, and the British, and became known as Scotland.

The kingdom prospered during the 12th and 13th centuries, particularly under the reigns of Alexander II (1214-49) and III (1249-86). After the death of Margaret, the Maid of Norway, an argument over succession to the throne resulted in the interference of Edward I of England in Scottish affairs. Although de Baliol was chosen king over Robert Bruce in 1292, Edward I invaded Scotland in 1296 and attempted to retain sovereignty of the land by force. Scottish independence was regained by the victory at Bannockburn under Robert Bruce, in 1314, and was recognized by Edward III in 1328.

Robert II was the first king of the Stuart dynasty; his reign (1371-90) began a period marked with internal strife and periodic war with England and France over national rights. The reign (1542-67) of Mary, Queen of Scots, the daughter of James V, saw the triumph of the Protestant Reformation in Scotland, although Mary herself opposed it and finally was forced to abdicate. Her son, James VI, became James I of England in 1603. Upon the restoration of Charles II to the Scottish throne in 1660, the Presbyterian Covenanters were again persecuted, their discontent and revolt being repressed by armed force. After the Revolution, when Charles was deposed and William and Mary were crowned in 1688, the instability that still existed as long as the two kingdoms were separated led to an eventual union of the Parliaments of Scotland and England in 1707. See also *Jacobites.*

Scotland Yard (*skŏt′lạnd yärd*), a short street in London, England, the name of which is derived from the former palace used by Scottish kings when visiting England. It later became the headquarters of the Metropolitan Police of London, for which Scotland Yard has become a popular synonym. In 1890, new police headquarters, known as New Scotland Yard, were established on the Thames Embankment, Westminster.

Scott *(skŏt)*, DAVID, painter, born in Edinburgh, Scotland, Oct. 10, 1806; died there, March 5, 1849. The son of an engraver, he received instruction quite early, but soon turned from landscape engraving to painting. In 1828 he exhibited in Edinburgh and was elected to the Scottish Academy in 1829. He visited Rome (1832) but worked chiefly in his native city. His works, all characterized by a mystic romanticism, include cycles of drawings such as "The Monograms of Man" (1831); "The Ancient Mariner" (1837), illustrations to Coleridge's poem; and "Pilgrim's Progress" (1850).

His brother, WILLIAM BELL SCOTT (1811-90), a painter and poet, was known for a series of paintings of Northumbrian history.

Scott, DUNCAN CAMPBELL, poet, born in Ottawa, Canada, Aug. 2, 1862; died there, Dec. 19, 1947. After his graduation (1879) from Stanstead Coll., he went to work for the Canadian Dept. of Indian Affairs, becoming head of that agency in 1913. Although he remained a civil servant throughout his life, he also enjoyed a reputation as a poet. "The Magic House and Other Poems" appeared in 1893, followed by "Labor and the Angel" (1898), "New World Lyrics and Ballads" (1905), and other volumes. Many of his best poems are narratives of Indian life. Scott also wrote short stories and, with Pelham Edgar, edited the "Makers of Canada" series.

Scott, HUGH LENOX, soldier, born at Danville, Ky., Sept. 22, 1853; died in Washington, D.C., April 30, 1934. After graduating from West Point (1876), he saw active service during the Indian campaigns in the West (1876-92). While on duty in the Sioux territory he learned the Indian sign language, a skill which made him valuable in negotiations with the Indians. Later he was adjutant general of Cuba (1898-1903), governor of the Sulu Archipelago (1903-06), superintendent of West Point (1906-10), and chief of staff of the U.S. Army (1914-17). He wrote several monographs on the Plains Indians and "Some Memories of a Soldier" (1928), an autobiography.

Scott, ROBERT FALCON, Antarctic explorer, born in Devonport, Devonshire, England, June 6, 1868; died in the Antarctic, *ca.* March 27, 1912. Entering the British Navy in 1880, he commanded two outstanding expeditions to Antarctica. During his first voyage in the *Discovery* (1900-04), he took soundings of the Ross Sea, founded King Edward VII Land, surveyed the coast of Victoria Land, and explored much of the Antarctic continent. Scott again set out for the Antarctica in 1910, with the purpose of reaching the South Pole. In November 1911 he reached his base in the Antarctic and started for the South Pole on foot with four companions, reaching his destination on Jan. 18, 1912—only to find that Roald Amundsen (*q.v.*) had preceded him by one month. On the return journey, the party perished of frostbite, exposure, and lack of food. Scott's diaries and scientific records of the exploration were recovered with his body and published as "Scott's Last Expedition" (2 vols., 1913). He also wrote "The Voyage of the Discovery" (1905).

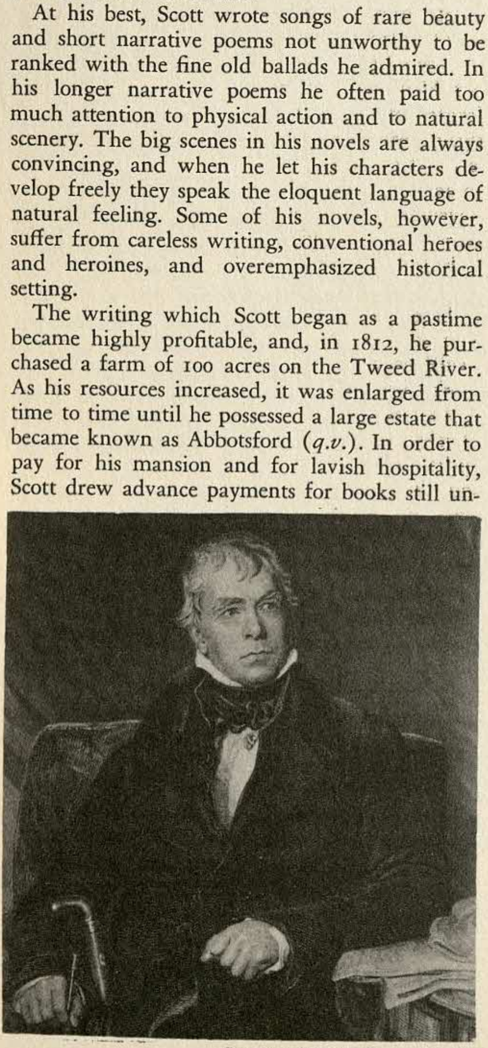
ROBERT F. SCOTT

Scott, SIR WALTER, poet and novelist, born in Edinburgh, Scotland, Aug. 15, 1771; died at Abbotsford, Sept. 21, 1832. He came of old Border families and early acquired a profound knowledge of Scotland's historic past. When he was 18 months old his right leg was crippled by infantile paralysis, but he developed a physique nearly as active as it was powerful. He studied at Edinburgh Univ. and in his father's office, but most of all by wide reading and frequent explorations of the Scottish border country. In 1797 he married Charlotte Margaret Carpenter. In 1820, he was made a baronet.

Legal appointments (as sheriff-deputy of Selkirkshire and clerk of session in Edinburgh) allowed him to devote much of his time to literature. He excelled as a collector of ballads, as an editor, as a biographer, and as a writer of miscellaneous prose; but he is chiefly known as poet and novelist. His best narrative poems were "The Lay of the Last Minstrel" (1805), "Marmion" (1808), and "The Lady of the Lake" (1810), but he composed his finest verse in the songs and anonymous chapter headings in his novels. His first historical novel, "Waverley" (1814) was issued anonymously because he doubted its success, and novels were lightly regarded by men in the legal profession. The author was called "the Great Unknown," and his 26 later novels were called the Waverley novels. The most original of these deal with life in 17th- and 18th-century Scotland, such as "Guy Mannering" (1815), "The Antiquary" and "Old Mortality" (1816), "Rob Roy" (1817), and "The Heart of Midlothian" (1818). Of the novels laid elsewhere, the finest is "Quentin Durward" (1823), but "Ivanhoe" (1820) is the most popular. Only "St. Ronan's Well" (1824) is a novel of manners; most of his other works are historical romances, all based on a profound knowledge of history and of human character.

At his best, Scott wrote songs of rare beauty and short narrative poems not unworthy to be ranked with the fine old ballads he admired. In his longer narrative poems he often paid too much attention to physical action and to natural scenery. The big scenes in his novels are always convincing, and when he let his characters develop freely they speak the eloquent language of natural feeling. Some of his novels, however, suffer from careless writing, conventional heroes and heroines, and overemphasized historical setting.

The writing which Scott began as a pastime became highly profitable, and, in 1812, he purchased a farm of 100 acres on the Tweed River. As his resources increased, it was enlarged from time to time until he possessed a large estate that became known as Abbotsford (*q.v.*). In order to pay for his mansion and for lavish hospitality, Scott drew advance payments for books still unwritten. In 1825 a London publisher failed, carrying down Scott's publisher, Constable and Co., and ruining the printing firm of Ballantyne, in which Scott was a partner. He refused to take refuge in bankruptcy and promised to pay off all the Ballantyne debts, about £130,000. Placing all his resources in trust for his creditors, he devoted his pen to their service. In 1826 his wife died, and, in 1830, he suffered a stroke of apoplexy. In 1831, thinking his debts were discharged, he agreed to a Mediterranean tour for his health. He returned home to die, but his debts were later paid in full through his royalties, the sale of his copyrights, and the profits on the "Life of Scott" by his son-in-law John Lockhart.



Courtesy Brown Bros., N. Y.

SIR WALTER SCOTT

Scott, WINFIELD, general, born in Petersburg, Va., June 13, 1786; died at West Point, N.Y., May 29, 1866. He was educated at William and Mary Coll., studied law, and was admitted to the bar (1806). Abandoning the law for a military career, he entered the army as a captain in 1808 and soon distinguished himself in the War of 1812. Although he fought with bravery at Queenston Heights, he was captured, exchanged, and then sent to command the Canadian frontier, where he routed the British at Chippewa and Lundy's Lane. Promoted (1814) to major general, he thereafter pursued a colorful career as a military hero and arbitrator of border disputes. He took part in the Black Hawk War (1832) and later that year commanded in South Carolina during the nullification troubles. He also served in the Seminole and Creek campaigns (1835-37) and settled with Great Britain the disputed boundary line between Maine and New Brunswick (1839). From 1841 to 1861 he was Commander-in-Chief of the Army. During the Mexican War (1846-48), Scott began a bold march on Mexico City early in 1847, taking Cerro Gordo, Contreras, Churubusco, Molino del Rey, and Chapultepec in a brilliant series of strategic moves before he entered Mexico City on Sept. 14.

Nominated for the Presidency by the Whigs in 1852, he lost to his Democratic opponent, Franklin Pierce. Although he was a Southerner, Scott opposed secession and remained loyal to the Union cause after the outbreak of the Civil War. He commanded the Union forces at the start of hostilities, but his pessimism reflecting upon the conduct of the war, as well as his failing health, led to his retirement in November 1861. He wrote army manuals and published his "Memoirs" (1864).

Scotti (*skŏt'ĭ*), ANTONIO, singer, born in Naples, Italy, Jan. 25, 1866; died there, Feb. 26, 1936. He made his debut as an operatic baritone at Malta, in 1899, and was thereafter acclaimed by opera audiences in London, Chicago, and in South American capitals. In that same year, he joined the Metropolitan Opera Company in New

York, where his vocal and acting ability made him a leading baritone. His most memorable roles included those of *Don Giovanni* in the opera of the same name, *Scarpia* in "La Tosca," *Iago* in "Otello," and *Amonasro* in "Aïda."

Scottsboro Case (*skŏts′bûr-ō kās*), a series of legal proceedings growing out of the arrest of nine Negro youths (March 9, 1931), on charges of raping two young white girls. Eight of them (the ninth was only 13 years old) were sentenced to death at a trial held in Scottsboro, Ala., early in April. Believing the verdict to be the outcome of racial bias, many people throughout the nation came to the defense of the Scottsboro boys, making of the case a *cause célèbre*. On appeal, the U.S. Supreme Court reversed the conviction, holding that the defendants' legal counsel was inadequate. In a series of appeals and retrials that dragged on until 1937, several of the defendants were convicted and sentenced to long prison terms. Another, Heywood Patterson, considered by the prosecution to be the ringleader of the group, received the death sentence—despite the denial of the original charges on the part of one of the plaintiffs. The death sentence was commuted and changed to 75 years' imprisonment, however, on the grounds of lack of sufficient evidence. At the 1936 trial, indictments against four defendants were dropped, and in 1940 the Alabama parole board began to review the cases of the other defendants. By 1946, all of the Scottsboro boys had been freed except Patterson, who escaped from his Alabama prison in 1948. Two years later, he was apprehended in Michigan, but was freed when the governor of that state refused to extradite him to Alabama (July 1950). Patterson was coauthor (with Earl Conrad) of "Scottsboro Boy" (1950).

Scouring Rush (*skour′ing*). See *Horsetail.*

Scranton (*skrăn′tŭn*), a city of Pennsylvania, county seat of Lackawanna County, in the northeastern part of the state. It is on the Lackawanna River, 124 m. N. of Philadelphia, and 133 m. N.W. of New York City by highway. It is served by the Delaware, Lackawanna & Western, the Delaware & Hudson, the Central of Pennsylvania, the Erie, and the New York, Ontario & Western R.R.'s. The Everhart Museum of Natural History, Science, and Art, and a zoological garden are located in Nay Aug Park.

Scranton's industrial importance has been built on the vast quantities of anthracite coal mined in the surrounding area, but the development of varied manufacturing has been encouraged. Currently, the city's industrial output includes railway, marine, and mining equipment, textiles, clothing, metal products, furniture, shoes, chemicals, and foodstuffs. Scranton is also a wholesale distributing center for a large area in northeastern Pennsylvania and southern New York.

Courtesy Scranton Chamber of Commerce

SCRANTON. LACKAWANNA COUNTY COURT HOUSE

Scranton's history dates from 1786 when the Abbott brothers, Philip and James, came from Connecticut and erected a sawmill and gristmill on the banks of Roaring Brook, which passes through the city before emptying into the Lackawanna River. The Abbotts' holdings were eventually acquired by Ebenezer Slocum, who erected a charcoal forge to manufacture iron and gave the town its first name, Slocum Hollow. It was not until 1840 that Scranton's industrial birth occurred. Five blast furnaces, using anthracite coal, were built by a group of pioneers headed by George W. Scranton, who gave the city its present name. It was incorporated as a borough in 1854 and chartered as a city in 1866. Population, 1940, 140,404; 1950, 125,536.

Screamer (*skrēm′ẽr*), a family of three South American birds related to the ducks and geese. They are wading birds but swim readily, although the toes have only rudimentary webs. They have a characteristic trait of soaring in wide circles high in the air. The northern and southern crested screamers have a long occipital crest; the horned screamer has a long, whitish horn on the forehead. All three have two powerful spurs on each wing. The bulky nest is made of reeds, usually resting on the bottom of shallows but sometimes afloat. The food is largely composed of insects, water plants, and seeds.

Screen (*skrēn*). See *Half Tone; Television.*

Screw (*skrōō*), a fundamental mechanical device consisting of an inclined plane applied around a cylinder. In the operation of a screw, mechanical advantage is obtained as successive rings of the inclined plane pass a given point. The distance between adjacent peaks or coils is called the "pitch." When used for making attachments to substances softer than itself (as a metal screw used on wood), the screw is usually constructed on an expanding conical cylinder which acts to separate the fibers of the receiving material; when used on a harder or more brittle substance, incapable of retaining the screw by friction alone, an auxiliary screw fashioned on the inner surface of a corresponding cylinder is used. This inverted screw is called a "nut." If one be turned while the other remains fixed, as in the vise, there is an advance equal to the distance between two connective threads.

The mechanical effect is increased by making the threads finer, or decreasing the distance between them, or by increasing the length of the lever by which the power is applied. If the power moves through a circumference of 30 in. and the distance between two consecutive threads is ⅒ in., a force of one pound applied at the head of the screw will move a weight of 300 pounds at the other end, since the power moves through a distance 300 times as great as that which the weight moves. Equilibrium results when the circumference at which the force is applied bears the same proportion to the pitch of the screw as the distance bears to the applied force. Thus friction enters very largely as a modifying element.

Many forms of the screw are employed in machinery and mechanical arts. In general it is used to exert great pressure or overcome great pressure through a short distance. Among the common forms are the screw nail, for fastening separate pieces of material; the gimlet or bit, for boring; and screw presses and jack-screws, for securing pressure. Other forms include the endless screw, ball screw, screw conveyor, archimedian screw, screw propeller (*q.v.*), etc.

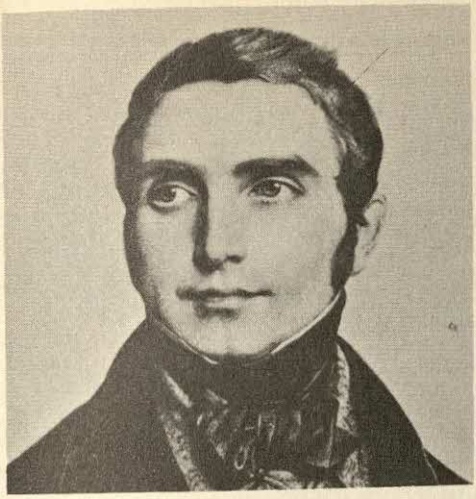
Screw Pine (*skrōō pīn*), or PANDANUS, a genus of tropical plants in the Eastern Hemisphere, so named from their spiny-edged leaves. They include both shrubs and trees and bear some resemblance to the palms. The leaves are 2 or 3 ft. long, are shaped like a sword, and occur in three spirally arranged rows. When without branches, they resemble pineapple plants. The common screw pine grows to a height of 25 ft. and thrives in a poor but moist soil. Natives gather the unexpanded flowers as articles of food, and the odor of the bloom is used in making perfumes. An allied species grows somewhat taller and has leaves from 6 to 10 ft. long. The leaves yield fibers that are of value in making gunny bags. These trees are most abundant in Southern Asia and the East Indies. Some species are grown as ornamental plants in greenhouses.

Screw Propeller (*skrōō prō-pĕl'ẽr*), a contrivance used in the construction of vessels of various kinds. It utilizes the principle of the screw in acting upon the water and is driven by a power engine (steam, gasoline, diesel, or electric). It consists of a cylindrical or spherical hub, to which blades are attached so as to form the screw. Some are cast in one piece, while others are built up by bolting the blades to the hub, both being of bronze, iron, or steel. The shaft is made very strong and passes parallel to the keel into the engine room, where the power is applied to cause it to revolve rapidly. Back of the ship, projecting from the stern, is the screw, usually submerged entirely below the surface of the water. One or more engines act upon the shaft either by cranks formed on the shaft or by means of geared wheels. The screw turns in the water as a bolt turns in a nut but the pitch is not constant at all points, since it varies somewhat near the hub. No absolute rule can be given in reference to the diameter and pitch of the screw, which varies according to the speed desired and the size of the vessel to be propelled. Patents on screw propellers were awarded independently to John Ericsson and F.P. Smith in 1838. The screw came into general use in 1870 and it is now generally employed except where the water is too shallow.

Scriabin (*skryâ-bĭn'*), ALEXANDER NIKOLAEVICH, composer, born in Moscow, Russia, in 1872; died in 1915. As instructor of piano at the Moscow Conservatory (1889-1903), Scriabin established a reputation as a leader of the extremist movement in modern music. His much-discussed "color keyboard" was an attempt to prove an aesthetic relationship between music and color. Among his compositions are sonatas, études, preludes, dances, symphonies, etc.

Scribe (*skrīb*), an order of teachers among the ancient Jews, whose office was to write and teach the Mosaic and traditional law. The name was first applied to military secretaries, who kept the records of the nation, recruited and organized troops, and levied the war taxes. At the time of the Babylonian captivity the language in which the law was written had become obsolete and a new order of scribes had arisen among the Levites, of whom Ezra was chief. To them was entrusted the task of transcribing and translating the law, and of applying it to conduct. They grew rapidly to influence, and at the time of Christ comprised the learned body of the nation: They were looked upon as public teachers and lawyers. Their rank was in accordance with their talents. The higher class occupied a place in the sanhedrin, practiced law, or taught in schools, while the less gifted were employed in transcribing and writing laws.

Scribe (*skrēb*), AUGUSTIN EUGÈNE, dramatist, born in Paris, France, Dec. 24, 1791; died there, Feb. 20, 1861. He studied law but soon turned his attention to the stage and began to write songs and light comedies. His first play "Le Prétendu sans le Savoir" (1810), was not well received, but, in 1816, he achieved his first great



AUGUSTIN EUGÈNE SCRIBE

successes with "Une Nuit de la Garde Nationale" and "Flore et Zéphire." From that time he wrote unceasingly, attempting every type of popular dramatic production, comedies, vaudevilles, opera libretti, and even tragedies. A tireless worker with an endless supply of new ideas, he frequently worked in collaboration with his friends, developing systematic methods so that each was assigned to a different task in the production.

His plays enjoyed an immense popularity and over a period of 50 years provided a major theatrical entertainment of the middle classes. He possessed an uncanny sense of their tastes and, as he was thoroughly versed in techniques of the stage, he conjured up many new devices, clever plots, and the light, vivacious, often exceedingly vulgar, dialogues which appealed to his audiences. His characters have little depth, and his style verges on the crude, but in many respects his work is an interesting reflection of the ideas and attitudes of a certain milieu in the society of his time. In short, he was one of the creators of modern vaudeville.

He is supposed to have provided 150 plays to the Gymnase Theater alone, between 1816 and 1830, and his complete works, published in 76 volumes (1874-85), included 400 plays. Many of these, of course, were written in collaboration.

Following are the best known of his works, some of which were produced in the leading cities of Europe and America: "Bertrand et Raton" (1833), "La Camaraderie" (1836), and "Le Verre d'Eau" (1840). Outstanding among his libretti were "Fra Diavolo" (1830) by the composer Auber, "Robert le Diable" (1831) by Meyerbeer, "La Juive" (1835) by Halévy, and "Les Huguenots" (1836), "Le Prophète" (1849), and "L'Africaine" (1865) also by Meyerbeer.

Scribner (*sḳrĭb′nẽr*), CHARLES, publisher, born in New York City, Feb. 21, 1821; died in Lucerne, Switzerland, Aug. 26, 1871. After being graduated from Princeton Univ. he entered the publishing business in New York with Isaac D. Baker, the firm being known as Charles Scribner & Co. from 1850 on. In 1870 the firm undertook the publishing of *Scribner's Magazine*.

Scripps (*sḳrĭps*), EDWARD WYLLIS, newspaper publisher, born in Rushville, Ill., June 18, 1854; died Mar. 12, 1926. Edward Scripps, half-brother of James and Ellen Scripps, followed the publishing tradition of his family; with their financial assistance he founded the Cleveland *Penny Press* in 1878, and, after purchasing several other newspapers, went into partnership with Milton Alexander McRae to form the Scripps-McRae League of Newspapers (1895) and the Scripps-McRae Press Assn. (1897), which he later combined with Publishers' Press to establish the United Press (1907). In 1902, he inaugurated the Newspaper Enterprise Assn., a successful syndicate supplying cartoons and features to his own and other newspaper chains. This organization, as well as a similar one established by S.S. McClure, made newspaper history as the first of such feature syndicates. In 1893, he bought an interest in the San Diego *Sun* and made it the keystone in a new West Coast newspaper chain. From his enterprises also grew the modern Scripps-Howard newspaper chain.

Scrivener's Paralysis (*sḳrĭv′nẽrz pȧ-răl′ĭ-sĭs*). See *Paralysis.*

Scrofula (*sḳrŏf′ū-lȧ*), a constitutional disease, affecting children mainly. It may lead to the formation of tubercles in various tissues and organs of the body, chiefly in the lymphatic glands. Scrofula is sometimes called *ḳing's evil,* from the view long held in England that the disease could be cured by the king's touch.

Scruple (*sḳrōō′p′l*), a weight equal to one-third of a dram, or the 24th part of an ounce, as used in apothecaries' weight. A scruple is equal to 20 grains.

Scudder (*sḳŭd′ẽr*), HORACE ELISHA, teacher and author, born in Boston, Mass., Oct. 16, 1838; died Jan. 11, 1902. He was graduated from Williams Coll. in 1858 and taught in the public schools of New York City for three years. In 1862 he published "Seven Little People and Their Friends," a work that proved so successful that he took up literature as a profession. He was editor of *The Riverside Magazine for Young People* from 1867 to 1870 and in 1890 moved to Cambridge, where he became the editor of the *Atlantic Monthly*. His numerous writings include "Dream Children," "Dwellers in Five-Sisters Court," "Men and Letters," and a monograph on "Noah Webster." With Mrs. Bayard Taylor, he published "Life and Letters of Bayard Taylor."

Sculpture (*sḳŭlp′tûr*), from the Latin *sculptura,* the act or art of cutting, carving or other-

Courtesy Metropolitan Museum of Art, N. Y.

MARBLE BUST OF AUGUSTUS

ROME, 1ST CENTURY A.D.

wise rendering a solid material into an ornamental or esthetically significant form. The term includes figures carved directly into hard substances as well as those molded of plastic materials and then reproduced by casting in metal or being copied into stone or other substances.

Processes. Sculptures are of two classes, known as sculpture proper and relief. In sculpture *proper* the three dimensions of length, breadth, and height are reproduced, while in *relief* the dimension of thickness or depth is relatively reduced. Different names are applied to productions in relief according to the depth in which the object is represented. *Bas-relief* is a common form and is a type of carving or sculpture in which the figure projects but slightly above the background. *Mezzo-rilievo* is a type of sculpture in half-relief, and *alto-rilievo* is a form in which the carving or figures stand out very strongly from the background.

Materials and Methods. The materials generally used in sculpturing include marble, stone, ivory, gold, bronze, granite, and wood, but any substance that may be cut or molded into form is employed for various products. While paintings appeal to the sense of sight chiefly through color, sculptures rely mainly upon form, both of line and composition, thus differing from painting in the mode of expression. The artist usually models his work in moist clay, which in the case of a large statue is supported by a skeleton framework. If the finished product is to be in marble, a plaster cast is made from this model. Many modern artists, however, have reverted to the older method of creating sculpture immediately in the final material without the expedient of casting from an intermediate material.

History. Sculpture is one of the most ancient of arts. Its origin is lost in antiquity. The first productions were in clay, but as knowledge advanced other materials, such as wax, marble, and bronze, came into use. Most of the early Egyptian products are large, and are peculiar for symmetry, stability, and calm and solemn expression. The most distinct and dignified sculptures of Egypt date from the period included between 2600 and 1000 B.C., but there are large and remarkable productions dating from earlier times, particularly the *Sphinx,* which is thought to date from about 2800 B.C. Assyrian sculpture is like that of Egypt in representing historical and general scenes in relief. It dates from the 20th to the 14th centuries B.C. Persian sculpture reached its height of development in the period from 575 to 331 B.C. The early sculptures of India are chiefly in connection with the religion of Buddhism and later Brahmanism.

By the 7th century B.C. a distinct school had developed in Greece. Among the works of Greek art that have come down to us are the sculptures from the temple of Athena at Aegina, which date from about 490 B.C. Phidias carried Greek art to its highest perfection about 440 B.C. His most notable works are the statues of Athena in the Parthenon and that of Zeus in the temple at

Courtesy Brown Bros., N Y.

SEAT OF ELIA, CHURCH OF ST. NICOLÀ, BARI

MARBLE SCULPTURE, 11TH CENTURY

Courtesy Museum of Modern Art, N. Y.

MADONNA AND CHILD WITH THE YOUNG ST. JOHN
MARBLE RELIEF BY MICHELANGELO (1475-1564)

Olympia. Sculpture in his time mostly represented mythological figures and scenes; human beauty was characterized by spiritual and godlike perfection. New interest was awakened by Praxiteles about 350 B.C. This sculptor began to represent the human body with a different approach. Other noted artists of Greece include Scopas, Chares, and Agasias. Other works dating from about the 4th to the 2nd centuries B.C. include the celebrated "Laocoön," "Apollo Belvedere," "Venus of Milo," "Dying Gladiator," and "Dying Alexander," all showing ever-increasing realism. Their style is called Hellenistic (*q.v.*).

Roman sculpture was derived from Greek art. The Romans carried the finest treasures of art from Greece to Rome, but later on they created a style of their own in the characteristic portrait busts from the 1st century B.C. to the 3rd century A.D. Art declined in Italy with the barbaric invasions from the north.

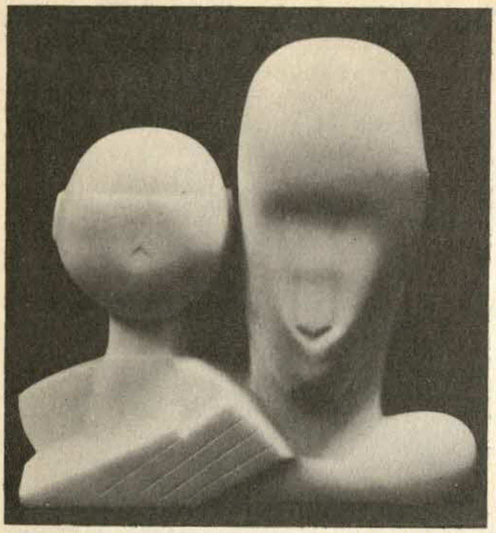
The 11th to the 15th centuries A.D. produced an entirely new, medieval architectural sculpture, first in the Romanesque, later in the Gothic style. Anonymous artists worked in close connection with the architects of the great cathedrals, creating magnificent statues of saints and kings along the walls, porches, and pillars of these buildings. They told biblical stories in relief, generally placed above the entrance doors. Sculptural art revived in Italy in the 13th century, when Nicola Pisano carved a number of fine specimens of art at Pisa and Siena. His son, Giovanni, is the next artist of note, but the most marked progress in the revival of art began with Lorenzo Ghiberti (1381-1455), who made the wonderful doors of the Baptistry of Florence. Donatello and Verrocchio in their art works represented the most important sculptures of the Renaissance period in Italy before Michelangelo. The perfection of Italian art was reached in the sculptures of Michelangelo in the 16th century, turning already to the Baroque forms; this style is best expressed in the works of Lorenzo Bernini (1598-1680).

In the 18th century, only the great French sculptors, like Houdon, Pigalle, and Falconet, were of importance. The 19th century was satisfied with feeble imitations of earlier styles, until at the end of the century a new generation of great French sculptors arose, such as Barye, Rodin, Maillol, and later on Despiau. The 20th century is characterized by a turn toward a condensation of forms and strong expressionism, as in the work of the great German sculptors Lehmbruck and Barlach, Kolbe and Sintenis. Corresponding to the general trend toward abstraction in art, Archipenko, Arp, Brancusi, Lipschitz, and Henry Moore also created new styles in sculpture.

In the U.S., sculpture as an independent art did not develop before the 19th century. U.S. sculptors expressed their art primarily in memorials and monuments to historic events and personalities, and they leaned toward the traditional French 19th-century style. George Grey Barnard, Gutzon Borglum, Daniel Chester French, Augustus St.-

Courtesy Metropolitan Museum of Art, N. Y.

THE THINKER
BRONZE STATUE BY AUGUSTE RODIN (1840-1917)



Collection Museum of Modern Art, N. Y.

MOTHER AND CHILD

CONTEMPORARY MARBLE GROUP BY JACOB EPSTEIN

Gaudens and Frederick MacMonnies were the leading artists. Lorado Taft was the first to show modern trends, which were then taken up in our day by Jacob Epstein, Jo Davidson, and Malvina Hoffman. These artists have tried to find a median position between both extremes, the traditional and the abstract.

Scurvy (*skûr'vy̆*), or SCORBUTUS, a dietary deficiency disease due to lack of vitamin (*q.v.*) C (ascorbic or cevitamic acid), and characterzed first by spongy, swollen, bleeding gums, then by painful hemorrhages into the bones, joints, and muscles, purple hemorrhagic spots in the skin, severe general weakness, loss of appetite, and loss of weight. The fundamental cause of scurvy is fragility of the blood capillaries, to which vitamin C is essential for maintaining strength and health. At present the disease occurs mostly in artificially fed infants who are not given fruit juices, tomato juice, or pure vitamin C. Few adult cases are now seen because several months on a diet entirely lacking fruits and vegetables are necessary to produce acute symptoms. Death may occur (though rarely) from hemorrhage, secondary infection, or exhaustion. Treatment consists simply of giving pure ascorbic acid by mouth and the institution of proper diet.

Formerly scurvy was very devastating in the navies and merchant marine of all nations, largely because of the difficulty of carrying fruits and vegetables on long voyages, but since the progress made in dietary knowledge and the introduction of a diet rich in vitamin C, the disease has virtually disappeared.

Scutage (*skū'tĭj*), in feudal law, a tax or fine imposed upon landowners in lieu of military service. Under this law the landholders were required to serve in the army when necessary, or to pay a designated sum of money as a tax or contribution instead of serving personally. Henry II of England established the system of scutage during his reign, 1154-88.

Scutari (*skōō'tȧ-rê*), a town of northeastern Albania, at the southern end of the Lake of Scutari, 12 m. from the Adriatic Sea. It exports skins, woolens, grain, and sumach. Formerly known as Scodra, it fell to the Romans in 168 B.C., was in Venetian hands at the close of the Middle Ages, and remained in Turkish hands from 1479 to 1913, when it became part of Montenegro as a result of the Balkan War. In 1913, Austria-Hungary forced Montenegro to cede Scutari to Albania. Population, *ca.*, 30,000.

Scutari, a city of Asiatic Turkey, on the eastern shore of the Bosporus, opposite Constantinople. It occupies a fine site on slopes gradually rising from the water, has good rail road facilities, and is the seat of a large interior and foreign trade. Its extensive cemeteries are famed for their cypress trees and monuments. The high degree of interest in the cemeteries is due to the fact that the Turks look upon Asiatic soil as sacred, in which they desire to have their last resting place. Scutari is well fortified. It has a large trade in cereals and fruits. Among the manufactures are cotton textiles, silk and woolen goods, saddlery, implements, and machinery. The English occupied Scutari in the Crimean War. Florence Nightingale made Scutari the base of her operations during that war. Locally the town is called Üsküdar. Pop., *ca.* 125,000.

Scylla and Charybdis (*sĭl'ȧ and kȧ-rĭb'dĭs*), two personages described by Homer, who regarded them as highly dangerous to navigators. Scylla is at present the name of a rock in the Strait of Messina, on the western coast of the southern part of Italy, and near it, nearly opposite the entrance of the harbor of Messina, Sicily, is the celebrated whirlpool of Charybdis. The ancients associated the legend of Scylla and Charybdis with these two dangerous obstructions, representing Scylla as a monster with 12 feet and six mouths. According to the legends, Charybdis three times each day sucked down the water of the sea, and as often threw it up. When Ulysses passed the terrible dangers of Scylla and Charybdis, the former swooped down and seized six of his crew from the deck. From this circumstance arose the proverb, "To shun Charybdis and fall prey to Scylla."

Scyphomedusae (*sī-fô-mê-dū'sē*), a class of invertebrate animals which includes the majority of jellyfishes.

Scythe (*sīTH*), an implement used for mowing and reaping. It consists of a long, curved blade attached to a long handle. The blade is sharpened on its inner or concave side, and is swung with both hands, the workman holding it by two smaller handles attached to the principal one. The scythe was preceded in general use by the *sickle* (*q.v.*), an instrument with a short, curved blade and a wooden handle, to be held in one hand when reaping. Later a framework of wooden bars was fastened above the blade of the scythe, thus forming the *cradle*. The scythe is nowadays used mostly in cutting grass and weeds on small farms. The scythe and cradle are now generally used in countries where farming is on a small scale or in a primitive state, the reaper having taken their place in all leading agricultural countries. However, most farmers keep a scythe for various purposes, such as cutting weeds and grasses where a mower cannot be used. In art the scythe is used to symbolize time, death, agriculture, and Saturn.

Scythians (*sĭth′ĭ-ạnz*), a nomadic people of antiquity, speaking an Indo-Iranian language, who are described in the histories of Herodotus. In the 8th century B.C. they lived in the region of southern Russia between the Dnieper and the Don rivers and in the Crimea. After the 7th century they served as mercenaries in the Greek armies in return for wine, jewelry, and other luxury items. They invaded the Assyrian empire in the 7th century, extending their conquests as far south as Palestine, and spread westward into the Balkan Peninsula. In 512 B.C. Darius I checked their expansion. Thereafter their power declined, until in the 3rd century B.C. they were replaced by the kindred Sarmatians (*q.v.*).

The Scythians were skilled horsemen, with a remarkable proficiency in handling the bow and arrow on horseback. Although they remained nomads, other groups within their territories, probably the earlier inhabitants, were agricultural. Scythian pottery and metalwork is often adorned with elaborate representations of animals and humans. Like other primitive peoples, the Scythians practiced mound burial, interring horses, furniture, clothing, food, slaves, and gold with the bodies of their kings and chieftains.

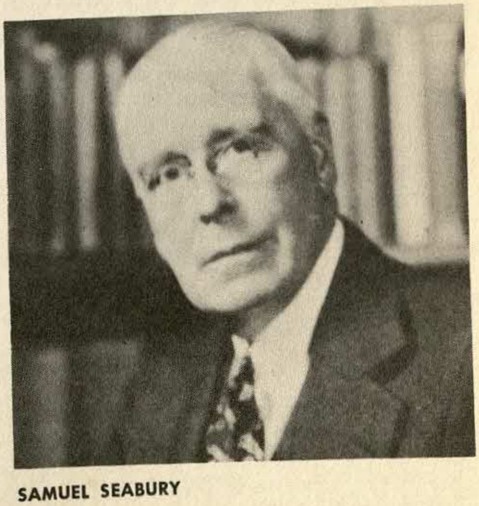
Sea (*sē*), a large body of salt water, more or less landlocked and usually connecting with or forming part of an ocean. See *Ocean*.

Sea Anemone (*sē ạ-nĕm′ō-nē*), a name given to several polyplike marine animals belonging to the phylum Coelenterata, including the jelly fishes, hydras, and certain coral organisms. The sea anemone is very colorful and plantlike (hence the name). It fastens itself to the sea bottom or some object by a pedal disc, from which arises the polyp's cylindrical body. A narrow slitlike opening or mouth is located at the uppermost end, surrounded by as many as a thousand tentacles. The tentacles, armed with special stinging cells, can be moved around and are used to catch small animals. The sea anemone reproduces sexually and asexually. Sexual reproduction results in a temporarily free-swimming larva which later anchors itself and develops into a polyp. The asexual method, a form of budding, results in the outgrowth from the original individual of another polyp, which will break off from the parent. See anemones vary in size. One common form, *Metridium*, attains a height of *ca.* 4 in. and a diameter of *ca.* 3 in.; it is found from shallow tide pools to a depth of 100 fathoms.

Seabees (*sē′bēz*), popular name (derived from the initials C.B.) for the U.S. Naval Construction Battalions of World War II, organized in 1941. Recruited principally from volunteer construction workers, the 250,000 men who served in this force built many of the Navy's overseas bases, often under enemy fire.

Seaborg (*sē′bôrg*), GLENN THEODORE, chemist, government official, born in Ishpeming, Mich., April 19, 1912. At the Univ. of California, where he received his Ph.D. (1937), he became a faculty member (1939), director of nuclear chemical research (1945), and chancellor of the Berkeley campus (1958); but he retired in 1958. Working (1942-46) on chemical separation at the Univ. of Chicago, he helped in the discovery of the isotopes plutonium-239 (1941) and uranium-233 (1942). He also discovered or assisted in the determination of elements 94 to 102 (see *Atomic Weight*). For the discovery of plutonium, he and Edwin M. McMillan (*q.v.*) received the Nobel Prize for chemistry in 1951. In 1961 Seaborg was appointed chairman of the U.S. Atomic Energy Commission; he had previously (1946-50) been a member of its general advisory committee.

Seabury (*sē′bĕr-ĭ*), SAMUEL, lawyer, born in New York, N.Y., Feb. 22, 1873; died in East Hampton, L.I., May 7, 1958. Admitted to the



SAMUEL SEABURY

bar in New York State in 1894, Seabury began practice in New York City. He served on the state supreme court from 1906 to 1914 and on the state court of appeals from 1914 to 1916, when he resigned to wage an unsuccessful campaign as the Democratic candidate for the governorship of New York. Noted for his work in exposing corruption, Seabury investigated New York City's magistrate courts in 1930 and the office of the New York County district attorney in 1931. As counsel (1931-32) to the state legislative committee investigating the government of New York City, Seabury uncovered many cases of bribery and graft. This inquiry led to the resignation of Mayor James Walker (*q.v.*) in 1932. Seabury was then instrumental in introducing the conception of Fusion government in New York City, which culminated in the administrations of Fiorello La Guardia (*q.v.*).

Sea Cow (*sē′ ḳou*), an extinct aquatic herbivorous mammal of the order Sirenia, was discovered by Vitus Bering and George Wilhelm Steller in 1741. The last Steller's sea cow (*Hydrodamalis stelleri*) in existence was exterminated only 27 years later. It was by far the largest of any of the Sirenians, reaching a length of 30 ft.; large individuals weighed up to four tons. Steller's sea cow was restricted to Copper and Bering, a small group of islands in the Bering Sea off Kamchatka, and never ventured beyond the shallow waters of these islands. George W. Steller, who was the only trained naturalist to see this animal in the flesh, described it as having the forward parts like a seal while the rear half was fishlike. The tail, which resembled that of a whale or porpoise, was developed into paired horizontal flukes terminating in a notch at the midline. The animal had no hind limbs and the fore feet were clublike and doubled under at a joint in a hook. These remarkable feet were of no assistance to the animal when swimming but served to haul it along in shallow water when feeding. The hide had an outer covering 1 in. thick, wrinkled and cracked like the bark of a tree. In place of teeth were two pairs of grooved horny plates set in the palate and jaws which served to grind the seaweed on which the animal fed. It had relatively small eyes and no trace of an external ear. Steller's sea cows lived like cattle in herds at sea and fed in the same manner as oxen with a slow forward motion, lifting their heads at frequent intervals to breathe. A conservative estimate of the number of Steller's sea cows in existence at the time of the discovery would not exceed 1,500 individuals. Its numbers were kept small by the depredations of the killer whale. This arch-enemy was perpetually on the watch for any unfortunate individual that strayed beyond the protection of the shallow shore waters.

The origin of this slow-moving, inoffensive creature is a mystery. It seemingly was a survivor of a bygone age and ill-fitted to cope with more progressive and aggressive animals. Steller's sea cow ranked near the bottom in the scale of animal mentality and never learned to fear man who so quickly exterminated its race.

Sea Cucumber (*sē ḳū′ḳŭm-bẽr*), or HOLOTHURIA, the name of the highest class of radiated animals, so called from their elongated and more or less warty and cylindrical form. Some writers designate them as sea slugs, owing to their vermicular mode of creeping. When parts of the body are destroyed, they are reproduced quite rapidly. The body is rather soft, having no covering like that of the starfishes and sea urchins, and motion is effected principally by longitudinal rows of suckers on the sides of the body. Water introduced and ejected causes motion and enables them to extend the body greatly in length and width. The sexes are distinct and some multiply by means of fission, but most species propagate by means of eggs. In size they vary greatly, ranging from the small species off the New England coast to the large size in the Bay of Fundy and on the shores of Newfoundland. Species from 10 in. to 1 ft. in length and from 3 to 4 in. in circumference are found in the mud flats of the Florida reefs.

Sea Eagle (*sē ē′g'l*). See *Eagle*.

Sea Horse (*sē hôrs*). See *Hippocampus*.

Seal (*sēl*), a common name when correctly used, applies only to those members of the suborder Pinnipedia in the family Phocidae. The typical or true seals had ancestors who took to the water long before the sea lions, and they have now reached a stage in development where progress on land is difficult. However, they still retain some land-mammal characteristics that force them to spend part of their existence out of water. The hind limbs, which extend directly backward from the body, cannot be rotated forward and are modified as sculls for swift propulsion in the water. In the true seals there is no external ear and the coarse hair is without underfur. Seals must leave the water when they give birth to their young. The young are not able to enter the water for several weeks without drowning and must learn to swim.

Seals are of great economic importance to the native peoples of the extreme north and south, and it is here that they are found in greatest abundance. Seal meat and blubber are the chief sources of sustenance to the Eskimos during the cold winter months, and the skins are used for clothing. Commercial sealers take many thousands of seals for leather and oil.

THE HARBOR SEAL (*Phoca vitulina*) is a relatively small seal that varies in color from yellowish gray spotted with black to almost black spotted with dull white. The newborn young are white but the first coat of hair is shed immediately after or even before birth. This is the seal most frequently seen along the coasts of temperate lands. There are six forms of harbor seal now recognized: *P. v. vitulina* inhabits the European side of the Atlantic and *P. v. concolor* the American side of the Atlantic; *P. v. richardii* occurs on the American side of the North Atlantic and *P. v. geronimensis* on the Pacific coast of Lower California and *P. v. largha* on the Asiatic side of North Pacific; *P. v. mellonae* is found at Seal Lake, Ungava Peninsula, Quebec.

The RINGED SEAL (*Phoca hispida*), though similar in color and size to the harbor seal, is a quite different species. It is a northern seal and circumpolar in distribution. The white fur of the newly born young is retained for about four weeks. The GREENLAND or HARP SEAL (*Phoca groenlandica*), reaches a length of 6 ft. and will weigh up to 800 pounds or more. Males are whitish in color with characteristic saddle bands of brown extending from the shoulder down along the sides and joining again on the lower back, and a black mask. The home range of the Harp seal is in the North Atlantic. The RIBBON SEAL (*Phoca fasciata*) is easily recognized by its unique color pattern. The almost black color is broken by a sharply defined white band around the neck, one around each foreleg and one around the posterior part of the body. It is not a common seal and is found only in the North Pacific Ocean.

The GRAY SEAL (*Halichoerus grypus*) is a large, coast-loving, silvery gray seal with blotches of dark color on back, and may reach a length of 10 or 12 ft. It occurs on both sides of the North Atlantic. The BEARDED SEAL (*Erignathus barbatus*) is a large grayish species, 10 to 12 ft. long, that inhabits the Arctic seas. It was so named because of the tufts of long bristles that hang down on each side of the muzzle. Two forms are recognized: the Atlantic form, *E. b. barbatus,* ranges from Newfoundland north to the ice fields; and the Pacific form, *E. b. nauticus,* is found from the coast of Alaska north and westward to Sakhalin. The CRAB-EATING SEAL (*Lobodon carcinophagus*), common along the edge of the ice pack in the Antarctic, varies in color from brownish gray to creamy white with few or no markings. Males may reach a length of 9 ft. The teeth of this seal are peculiar in having several long lobes which serve as a strainer to trap small crustaceans in the animal's mouth.

The ROSS SEAL (*Ommatophoca rossi*) is an olive-colored Antarctic species about 4½ ft. long and is quite rare. The LEOPARD SEAL (*Hydrurga leptonyx*), an Antarctic species, is the most ferocious of all the fin-footed tribe, and prefers warm-blooded prey; it also devours other seals and penguins. Its coat is yellowish gray dappled with numerous black spots. WEDDELL'S SEAL (*Leptonychotes weddelli*), common in the Antarctic, is about the size of the crab-eating seal but may be recognized by the blotches of yellowish white color on the back and by the simple peglike teeth.

Courtesy American Museum of Natural History, N. Y.

ELEPHANT SEAL

The MONK SEAL (*Monachus*) is a warm-water species, measuring about 6 ft. in length and dull dark brown in color. *M. tropicalis* is the West Indian representative of the genus; *M. schauinslandi* is restricted to the Hawaiian Islands; *M. albiventer* lives in the Mediterranean and Black Seas. THE CRESTED or HOODED SEAL (*Cystophora cristata*) is so named because the bladderlike nose in the males can be inflated to nearly twice the size of its head. It is found on the ice packs in the North Atlantic far from land. The NORTHERN ELEPHANT SEAL (*Mirounga angustirostris*) is much the largest of the true seals and reaches a maximum length of 18 to 20 ft. Males have a peculiar long proboscis of cavernous tissue that can be inflated at will and which, when distended, is suggestive of an elephant's trunk. Its habitat is now restricted to Guadalupe, Mexico. The elephant seal is peculiar in that it sheds the cuticle of the skin along with the hair. Large quantities of pebbles and stones have been found in its stomach but so far no trace of food to indicate the substances on which this animal feeds. The SOUTHERN ELEPHANT SEAL (*Mirounga leoninas*) occurs on some of the islands in the South Atlantic, South Pacific, and Indian Oceans. See also *Sea Lion.*

Trained seals have long been renowned as circus and carnival performers, noted especially for their ability to balance objects on the end of their noses. An institution for the training of seals for circus and theatrical purposes is maintained at Kingston, N.Y. Known as the "Seal College," it is the only institution of its kind in the U.S.

Sealed Orders (*sēld ôr′dĕrz*), the term applied to orders issued and delivered to the commanding officer of a ship or squadron, whose seal is not to be broken until the vessel has reached open sea, or a previously specified point. In such cases all on board are ignorant of the destination of the vessel, this being unknown even to the commander. Sealed orders are issued when a ship or squadron is sent on any secret service, the object being to prevent information regarding the movements becoming known. Sealed orders are also issued to members of the air forces.

Sealing Wax (*sēl′ing wăks*), a composition for sealing letters or packets, designed both to protect the message and receive the impression of a seal fixed to an instrument. In the Middle Ages sealing wax was made of beeswax and turpentine, and to these was added a coloring matter, usually vermilion. At present beeswax is not used in making sealing wax, but shellac is the principal component. The fine grade of sealing wax for stationery contains about seven parts of shellac, four of turpentine, and from three to four of vermilion. Inferior grades contain common resin and the coloring used is red lead, but black coloring is not infrequent. For strictly social or ornamental use, a wide variety of colors is available, including silver, bronze, and gold. Sealing wax was first employed in China in the 7th century, whence it was introduced into Europe.

Sea Lion (*sē′ lī-ŭn*), any of the many forms of fin-footed animals in the suborder Pinnipedia that have a small external ear and hind limbs capable of rotating forward to support the body, thus permitting relatively free progress on land. The males, or bulls, are larger than the females, or cows. Most sea lions usually live in herds which during mating season are broken up into large harems of cows with one bull to each harem. During the breeding season the bulls fight furious battles for possession of favorable breeding stations. Once territorial rights are settled the females enter the harem of the bull commanding the place of landing. Competition is keen, and a victorious bull, to hold his harem, must remain on shore without food during the mating season. The cows arrive later than the bulls and each gives birth to an open-eyed pup soon after coming ashore. From the first the pups are covered with fur; they learn to swim when about two weeks old. The sea lions are apparently of more recent origin than the true seals and have not yet invaded the North Atlantic.

Fur Seals or Sea-Bears (*Callorhinus* and *Arctocephalus*) are not true seals but typical sea lions. The name fur seal, however, was derived from the presence of a dense undercoat of soft fur in these animals. Their mode of life is similar to that of the other sea lions. The pelt of a fur seal in the raw state has no resemblance to the beautiful finished product used in the fashion mart. It first must be tanned and shaved down on the inner side to the roots of the long guard hairs, which latter are then drawn out and used for felt. The fur now exposed is cleaned, dyed, and separated, and then is ready to be tailored into articles of clothing.

The Northern Fur Seal (*Callorhinus alascanus*) is the best-known and finest of all the fur seals. Its breeding grounds are on the Pribilof Islands; in winter it migrates on the high seas as far as Japan and California but rarely comes in sight of land except to breed. It is relatively small as compared with the regular sea lions. Males are about 75 in. long and females 50 in. Adult males weigh between 300 and 500 lbs. In life the northern fur seal is gray in color. Because of the great value of its pelt and the fact that it was accessible to all nations, the northern fur seal was rapidly approaching extinction until the U.S. purchased Alaska. At that time treaties with Russia, Japan, and Canada placed the remaining fur seals in the custody of the U.S. government with a provision to share a permissible annual crop between the countries involved. From that time on, only the bachelor males, three or four years of age, were killed by government agents. By 1926 no less than 761,280 fur seals were counted at one time on the Pribilof Islands, and since that time the number of annual visitors has greatly increased.

The Southern Fur Seals (*Arctocephalus*) are divided into six species, widely separated geographically. In appearance they resemble the regular sea lions and though they do have an underfur, it is inferior to that of the northern fur seal. Townsend's Fur Seal (*Arctocephalus townsendi*) originally occurred along the Pacific coast of Mexico but is now restricted to Guadalupe Island. The Galapagos Fur Seal (*A. australis*) is still found on the Galapagos Islands and along the coast of Southern South America. The Australian Fur Seal (*A. doriferus*) occurs along the shore of Southern Australia. The Tasmanian Fur Seal (*A. tasmanicus*) inhabits the shores of Tasmania and the east coast of Australia. The New Zealand Fur Seal (*A. fosteri*) inhabits the coast of Southern New Zealand and Southern Australia. The African Fur Seal (*A. pusillus*) occurs near the Cape of Good Hope.

The California Sea Lion (*Zalophus californicus*) is a moderately large, slender, dark brown species found on the Pacific coast of North America from Northern California to Mexico. The body hair is without thick underfur. Males average 98 in. long and weigh about 600 lbs. Its food consists of many species of fish, crustaceans, and squid. This is the animal commonly seen in zoos and circuses, and on the famous Seal Rocks at San Francisco and Point Lobos, and referred to as a seal. A representative of this genus occurs on the Pacific islands of Northern South America. The Japanese Sea Lion (*Zalophus japonicus*) is found in the Asiatic side of the Pacific.

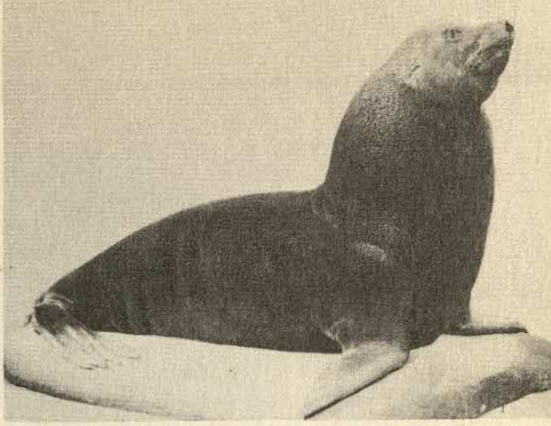
The Northern or Steller's Sea Lion (*Eumetopias jubata*) is the largest of the sea lions. Adult bulls may measure 13 ft. and weigh up to 1,800 lbs. In general form, Steller's sea lion resembles the California sea lion but its large size distinguishes it from the latter. This northern species ranges from California and the Japanese islands in the Pacific north to the Bering Sea. The Southern Sea Lion (*Otaria flavescens*) occurs on both coasts of South America from the Rio de la Plata and Peru around Cape Horn and on the Falkland and Galapagos Islands. Males may reach a length of 9 ft. and have a more or less distinct mane. The Australian Sea Lion (*Neophoca cinerea*) inhabits the rocky islands off the southern coast of Australia and may be recognized by yellow markings on crown and back of neck in the adult males. Hooker's Sea Lion (*Phocarctus hookeri*) is a little-known species found on the Auckland Islands south of New Zealand. Its grayish brown color, flattened head, and relatively long muzzle are the principal external characters of this species.

Sea Mouse (*sē' mous*), the name of a small worm found in the sea. It is covered with fine hairs or bristles, and so resembles the mouse in appearance. The body is about 2 in. long and when exposed to light the hairs show iridescent hues of great beauty. Several species have been described, some of which are found in the Atlantic at great depths. They are frequently brought to the surface or thrown upon the shore by storms.

Sea Otter (*sē ŏt'ẽr*), an animal found off the islands and shores of the North Pacific. It is about 3 ft. long, has a stout form and a massive head, and bears a dark brown fur of value in the market. Formerly these animals were very numerous along the coast from Puget Sound to Bering Strait, but fur traders hunted them so persistently that they have become rare. These animals live in the sea a greater part of the time and subsist principally on fish, crabs, and sea urchins.

Seaplane (*sē'plān*), an airplane designed to arise from and alight on water. See also *Aviation*.

Search (*sẽrch*), right of, the right of a belligerent nation to examine the papers and cargoes of private ships sailing on the high seas, in order to ascertain their character and destination. The right of search is limited to the officers of cruisers that have been lawfully commissioned by a nation at war. Ships cannot be detained or boarded by the public ships of another power in a time of general peace, since such an act is an intrusion upon the rights of the state whose ships are so visited. However, in time of war the general consent of nations yields to the belligerent the privilege of searching the ships professing to be neutral. This is quite necessary in order to have it known whether the neutral flag masks an enemy or covers contraband of war. Both persons and goods found concealed unlawfully may be captured. The War of 1812 was caused partly by England's insisting upon the right of search.


Courtesy American Museum of Natural History, N. Y.

FUR SEAL

Searchlight (*sẽrch'līt*), a mounted electric light, generating a powerful beam, illuminating objects at a distance; employed particularly in navigation, railroad yards, dams, locks and canals, as well as in warfare. In anti-aircraft use, a number of powerful searchlights, supplemented by radar (sound locators were used before the perfection of radar), are directed toward an enemy plane. The point at which the beams cross denotes the target for fire. Searchlights of the type perfected in World War II can cut the sky for a distance of as much as 5½ m. See also *Air Warfare; Reflector*.

Sea Serpent (*sē sẽr'pęnt*), the name of a monster supposed to exist in the sea. It has been described in the literature of many countries, but such an animal has never been captured and its existence is, so far as is yet known, purely mythical. Such a monster was first mentioned in Norse literature, in which it is described as being 200 ft. long and 20 ft. in circumference. Paul Egede, while on a voyage from Norway to Greenland, in 1734, claimed to have seen a living sea serpent. Since then numerous reports have been published. A.C. Oudemans, an English writer, in 1893, published an account of the various appearances of the sea serpent in a work entitled "The Great Sea Serpent." While a few scientific men are inclined to believe that some marine reptile like the plesiosaurus is in existence, the large majority give no credence to the suggestion. Periodically, up to the most modern times, mariners (but more often passengers) on the high seas, have continued to report sighting these animals; but no one has yet produced photographs or other satisfactory evidence. It is probable that schools of porpoises, the ribbonfish, or collections of seaweed are the source of the tales concerning this mythical animal. See also *Oarfish*.

Seas, FREEDOM OF THE, a principle of international law, referring to the high seas, which prohibits any nation from claiming jurisdiction over those waters outside of a fixed territorial zone. In time of peace, the high seas are open to all nations on an equal footing for the purposes of navigation (including the right to fly over those waters), fishing, exploration, and the laying of submarine cables. No state may exercise rights of jurisdiction other than over those vessels flying its national flag.

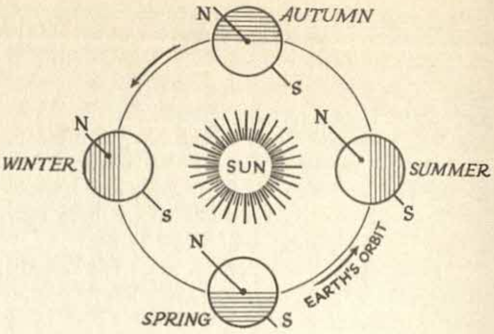
The expansion of maritime commerce in the Middle Ages led various nations to claim sovereignty over considerable areas of the world's oceans. Although these claims did not rest on legal principle, some of these pretensions were acquiesced to by other states, particularly by countries lacking the naval strength to contest them. It remained for Hugo Grotius (*q.v.*) to make the first effective case for the principle that the seas are open and free to all nations, in 1609. He expressed the concept that since the sea could not be occupied as land might be, it therefore belonged to all mankind. This point of view gradually gained adherents, and by the middle of the 19th century the principle of the freedom of the seas received the support of all maritime nations.

To preserve this freedom, numerous regulations relating to such diverse matters as safety of navigation, conservation of fisheries, and suppression of piracy have been adopted.

The meaning of the principle in time of war, with regard to the rights of belligerents and neutrals, once clearly defined, is being scrutinized under the collective-security structure of the U.N., which has rendered certain principles of belligerency quite obsolete.

Seasickness (*sē′sĭk-nĕs*), a form of motion sickness, produced in susceptible people by the motions of a ship at sea. Of the three separate motions of a ship (fore and aft ⇌, up and down ⥮, side to side ⇋), up and down is the most, side to side the least, distressing. The symptoms of pallor, sweating, nausea, and vomiting are directly related to a disturbance of the fluid balance in the semicircular canals in the inner ear (*q.v.*). Women are more easily affected than men. Bad odors and overeating aggravate the symptoms. Lying down and closing the eyes relieves the symptoms. Mild sedatives have been used to relieve the condition; hyoscine and scopolamine have been found effective, as have the antihistamines, particularly Dramamine.

Season (*sē′z′n*), the division of the year as determined by the position of the earth with respect to the sun and as marked by a particular state of moisture, temperature, vegetation, and difference in the length of day and night. The rays of the sun shine vertically on the Equator on March 21, and fall directly on localities farther north until June 21, when the sun is directly over the Tropic of Cancer. It begins to move southward on the latter date, shining vertically on the Equator on Sept. 22, but continues the movement southward until Dec. 21, when it shines vertically on the Tropic of Capricorn and thence again moves northward. The effect is that four seasons occur in the Temperate Zones, namely, spring, summer, autumn and winter. Only two seasons occur in the tropics, the wet and the dry, this being due to an almost uniform temperature throughout the year and to the fact that rain follows the sun. This results in a wet season succeeded by a dry season at the tropics, while in the vicinity of the Equator there are two wet seasons and two dry seasons each year, because the sun crosses the Equator twice each year. In effect there are but two seasons in the Arctic and Antarctic regions, a long, cold winter and a short, dry summer. The four distinct seasons are found only in the middle portions of the Temperate Zones. They are modified noticeably by proximity to the sea and elevation above sea level.



SEASONS IN THE NORTH TEMPERATE ZONE

In speaking of the seasons from an astronomical standpoint, it may be said that spring extends from the vernal equinox, when the sun enters Aries, to the summer solstice; summer, from the summer solstice to the autumnal equinox; autumn, from the autumnal equinox to the winter solstice; and winter, from the winter solstice to the vernal equinox. However, this is true only of the North Temperate Zone, since the seasons are reversed in the Southern Hemisphere. The greatest summer heat is not reached on June 21, when the days are longest, for the reason that as the rays of the sun shine more nearly vertically on the earth's surface, a quantity of heat is stored, and, when this is united with the heat received at the time the days begin to decline in length, the temperature gradually rises until the sun's rays fall quite obliquely on the surface. In the same way the coldest days do not occur near

Dec. 21, when the days are shortest, but some time thereafter, when practically all the latent heat stored in the surface during the summer has radiated. It will be observed that the warmest part of the day is shortly after noon and the coldest part of the night toward the morning.

Sea Squirt (*sē skwẽrt*), a name applied to a number of species of Asidians or Tunicates because of their habit, when irritated, of squirting jets of water from two small openings near the top. The adult is a small bag-shaped mass of gristly or leathery tissue. It lives attached to a stone, old log, shell, or seaweed, or it may be half-buried in the mud. The young are free swimming and somewhat resemble tadpoles. When the animal is ready to affix itself, its tail quickly disappears, and the creature rapidly assumes its tunicate shape. Sea squirts are found in the warmer seas of the world from low tide into deeper waters. They feed on microscopic life which they filter out of the water. They are interesting creatures to the zoologist, because in spite of their apparently very simple structure, they belong to the highest-developed phylum, Chordata, to which the animals with backbones belong.

SEATO (*sē′tô*), abbreviation of Southeast Asia Treaty Organization, established in 1954. See *Manila Treaty*.

Seaton (*sē′t'n*), FRED(ERICK) A(NDREW), newspaper publisher, born in Washington, D.C., Dec. 11, 1909. He studied at Kansas State Coll. and became a newspaperman. He was an aide to Alfred M. Landon (1936) and to Harold E. Stassen (1949), served as a member of the Nebraska state legislature (1945-49), and succeeded to the unexpired term of U.S. Sen. Kenneth S. Wherry, of Nebraska, in 1951. In 1952 he assisted with Gen. Eisenhower's campaign; in 1955 he became a member of the White House staff; and from 1956 to 1961 he served as U.S. Secretary of the Interior, succeeding Douglas McKay (*q.v.*).

Seattle (*sē-ăt′t'l*), a city and port of entry in west central Washington, seat of King county, the largest city in the state, situated on the eastern side of Puget Sound between the Olympic Mts. and the Cascade Mts. The city lies on a hilly neck of land between the sound and Lake Washington, which stretches along the city's eastern boundaries for 26 m. Seattle is closer to the Orient than any other U.S. port.

Like Rome, Seattle was originally built on seven hills, rising from sea level to an elevation of 512 ft. in the West Seattle section. The city covers an area of 91.56 sq. m., and within its boundaries are two fresh-water lakes, Lake Union and Green Lake. The former is used largely for shipping and terminal facilities but also provides moorage for many colorful houseboats. Lake Washington Canal connects Lake Union with Salmon Bay, which, in turn, open through the Hiram E. Chittenden Locks (Government Locks) into the Sound; the waterway provides passage for ocean-going vessels. Green Lake and the shore of Lake Washington are devoted to parks, beaches, and residential areas. Seattle has about 100 parks and playfields, comprising more than 3,000 acres, and many parklike scenic boulevards. The zoological gardens in Woodland Park include a model farm and extensive rose gardens. Volunteer Park, with its panoramic view of the city, is the site of the Seattle Art Museum. Important among Seattle's many religious structures are St. Mark's Cathedral (Protestant Episcopal) and St. James' Cathedral (Roman Catholic). Military complexes in the area include the Seattle Army Terminal, Ft. Lawton, the headquarters of naval district No. 13, and a U.S. Naval Supply Depot. Notable features of the city include the floating bridge linking Seattle with Mercer Island in Lake Washington, the Federal courthouse, the Public Safety Building, and the 42-story Smith Tower.

Courtesy Ewing Galloway

VIEW OF SEATTLE AND MT. RAINIER

As the commercial and transportation center of the Pacific Northwest, the city—in addition to about 80 steamship lines—is served by seven railroads, including the Union Pacific, Great Northern, Northern Pacific, and Canadian Pacific. The Seattle-Tacoma International Airport and Boeing Municipal Air Field furnish air transportation.

Seattle is primarily a manufacturing city. It produces military and commercial aircraft, light metals, trucks and buses, textiles, furniture, chemicals, and processed foods. Shipbuilding, agriculture, lumbering, fishing, and paper and pulp mills are also of major importance. The Seattle standard metropolitan statistical area (4,234 sq. m.; pop., 1960, 1,107,213) includes King and Snohomish counties. In 1958, the area had a value added by manufacture of $1,064,863,000; the city's value added was $752,978,000.

The public-school system enrolls about 95,000 pupils annually; another 15,000 pupils are educated at parochial schools. Institutions of higher learning include the Univ. of Washington, Seattle Univ., and Seattle Pacific Coll. The city has a symphony orchestra and several legitimate theaters.

Seattle operates under a 1946 charter (as amended) and has a mayor-council form of government. Its elected officials, a mayor and nine council members, serve four-year terms.

Seattle was first settled in 1852 and was incorporated as a city in 1869. It was named after a Duwamish Indian chief, Sealth, who befriended the settlers during the Indian wars of 1855. By 1884, when the first railroad reached the city, it was striving for the dominant position it now enjoys. A major fire in 1889 and the depression of 1893 temporarily halted the city's growth, but the Alaskan and Yukon gold discoveries of 1897 gave the city renewed prosperity and doubled its population. Since then, Seattle has shared in the general development of the Pacific Coast. Its decade of greatest growth was from 1900, when the population was 80,671, to 1910, when it was 237,194. In 1930 the figure had risen to 365,583; in 1950 to 467,591. In 1960 the population was 557,087.

Sea Urchin (*sē ûr′chĭn*), a marine animal belonging to the class Echinoidea, phylum Echinodermata. Many popular or localized names are frequently applied to the more conspicuous species. Sea urchins are round, disklike or hemispherical, and the surface is usually thickly covered with sharp spines, so that the animals look much like pin cushions, except that the pins are pointed outward. In some species the spines are small; in others they are very large and may be poisonous. The spines are movable, with a ball and socket base imbedded in the skinlike covering of the calcareous skeleton. If undisturbed in the water, the spines are expanded, but when touched they are rapidly drawn in together. When the animal dies, the spines drop off with the disintegration of the covering. Sea urchins propagate by small eggs. The young are free-swimming in the larval stage but pass through a complicated development. Living members, of which there are over 600 species, are found in all the warmer seas of the world from low tide to a depth of several hundred feet. In Europe, particularly along the Mediterranean, hundreds of thousands of these animals are eaten; they are also sold in many of the larger American markets. They are an important food for other sea animals, and shore birds feed upon them at low tide.

Sebaceous Glands (*sē-bā′shŭs glăndz*), in medicine, glands in the skin which secrete a certain amount of grease. When inflamed, the sebaceous glands may cause certain skin diseases, with accompanying development of pustules and acne.

Sebastian (*sē-băs′chan*), SAINT, Christian martyr, born in Narbonne, France, about the middle of the 3rd century; suffered martyrdom Jan. 20, 288. He was educated at Milan and entered the Roman army as a captain of the Pretorian guard under Diocletian, though without revealing his religious views. It thus became possible for him to protect the persecuted Christians and to convert the keeper of the prison to Christianity. Later he publicly confessed his faith. Diocletian made a strenuous effort to induce him to renounce the Christian creed, and, finding the task useless, had him condemned to be executed. The archers who were commissioned to execute him left him as dead, but a Christian woman named Irene found that life was not quite gone and restored him to health. Soon after recovery, Sebastian again appeared before Diocletian to confess his faith, whereupon the latter ordered that he be beaten to death in the amphitheater and his body be thrown into the sewer. His festival is held on Jan. 20. He has been made the subject of many fine paintings by Italian masters, including Veronese, Mantegna, and Domenichino.

Sebastian, DON, King of Portugal, born in Lisbon in 1554; died Aug. 4, 1578. He succeeded his grandfather, John III, in 1557 under a regency. At an early age he evidenced great fondness for the sciences and military conquests. In 1574 he conducted an expedition against Tangier, Morocco, and made a second invasion of that country four years later. In the Battle of Al Kasr he and a large part of his army were slain. Portugal now became a prey to anarchy and was soon annexed by Philip II of Spain. It was rumored among the people that their king was not slain and would return, and this gave rise to many impostors who pretended to be the true Sebastian. Later a myth was developed, which ultimately gave rise to many poems and romances. It is still believed by many peasants that Sebastian will yet return to restore his people to their ancient glory.

Sebastopol (*sē-băs′tō-pŏl*), or SEVASTOPOL, a seaport city of Soviet Russia, on the Black Sea. It is in the southwestern part of the Crimea and has railroad connections with Eurasian cities. It has a secure and commodious harbor, and large government dockyards. Sebastopol is the seat of a large interior and foreign trade, particularly in grain, hides, salt, and manufactures. It is strongly fortified. The harbor is sheltered on the north and south by lofty limestone ridges, and there are ample facilities for the largest vessels to anchor safely. The allied armies of Turks, French, and English conducted a memorable siege in the Crimean War of 1854-55, and the first bombardment took place on Oct. 17 of the former year. Gen. Todleben defended the land side against the French and English for 11 months, but on Sept. 8, 1855, the Russians evacuated the city. In World War I, the Germans occupied Sebastopol in May 1918, but were driven out by Allied forces after the armistice of Nov. 11, 1918. During World War II, the city fell to the Germans on June 12, 1942, after a seven months' siege but was retaken by the Red Army on May 9, 1944. Population, 1959, 148,000.

Secession (*sė-sĕsh'ŭn*). See *Civil War.*

Second (*sĕk'ŭnd*), may refer to time; *i.e.,* a second is 1/60 of a minute. In mathematics and geography, a minute is 1/60 of a degree (a circle contains 360 degrees). In music, it refers to the second degree of a scale and the corresponding interval. In duels, and some other matches, a second is one who aids and supports a contestant.

Secondary Schools (*sĕk'ŭn-dĕr-ĭ*). See *Schools.*

Second Empire (*sĕk'ŭnd ĕm'pīr*), a period in French history, from Dec. 2, 1852, to Sept. 4, 1871, covering the reign of Napoleon III and preceding the establishment of the Third Republic. See *France,* HISTORY.

Secord (*sē'kôrd*), LAURA, heroine, born in Massachusetts in 1775; died Oct. 17, 1868. She was the eldest daughter of Maj. Thomas Ingersoll, a British loyalist. In 1795 she moved to Canada, where she married James Secord. In 1813 she saved the British force at Beaver Dam under James Fitzgibbon from defeat by a larger force of Americans. She walked from Queenstown to warn her countrymen, and the 500 Americans who made the attack were compelled to surrender. A monument was erected to her honor at Lundy's Lane.

Secretary Bird (*sĕk'rė-tĕr-ĭ*), a genus of rapacious birds native to Africa and the Philippine Islands. They are so named from the fanciful resemblance between the crest, made up of a peculiar plume of long feathers, and pens projecting behind the ears of a clerk. The species native to South Africa is typical and is the best known. The head and neck are long, the height when standing is about 4 ft., the color is grayish-blue, and the tail is very long. The wings and legs are long. It can fly with facility when it is in the air, but greatly prefers to run. The natives and Europeans of South Africa protect it for its service in killing serpents, on which it feeds. It kills the serpents by inflicting severe injury with its feet and beak, or by dropping them from a high elevation while on the wing. Though sometimes bitten by venomous serpents, it appears to be entirely fearless. Secretary birds may be domesticated and used to protect poultry.

SECRETARY BIRD

Courtesy Union of South Africa Govt. Information Service, N. Y.

Secretion (*sė-krē'shŭn*), in physiology: (1) the process, carried on by certain organs of the body, of forming from materials extracted from the blood certain substances, some of which are thrown off from the body as waste products, and some of which are essential for carrying on certain functions; (2) the substance secreted. Some secretions are controlled by the nervous system and some by other secretions (see *Hormones*). Secretions are of two types. *External secretions* are those thrown out upon an internal or external surface of the body. These include sweat upon the skin, saliva from the salivary glands into the mouth, gastric juice from the lining of the stomach, which is essential for breaking down ingested food into products suitable for absorption from the intestine, and bile from the liver and gall bladder poured into the duodenum (the part of the small intestine nearest the stomach). Bile is essential in breaking down and emulsifying fat for proper absorption. Pancreatic juice, another external secretion, is poured from the pancreas into the duodenum along with bile. It is also essential because it contains certain digestive enzymes (ferments), as does gastric juice. Mucus is secreted along the entire course of the digestive tract as a lubricant and solvent. *Internal secretions* are those absorbed directly into the blood rather than thrown out upon a surface by way of a duct (note that all secretions are formed in organs called glands, *q.v.,* composed of special types of epithelial cells). All internal secretions are from a special group of glands composing the endocrine system, the products of which, passing directly into the blood stream, are called hormones. Hormones are essential to life: they act as messengers, stimulating agents, and controls over vital functions such as digestion, metabolism (production, storage, and utilization of energy from food), growth, and reproduction. Some essential hormones are those from the pituitary gland (situated at the base of the brain), which is the master gland of the body. Pituitary hormones control the thyroid gland (in the neck), which produces the hormone thyroxin to regulate metabolism and growth; the adrenal glands (situated one above each kidney), which produce adrenalin in times of stress to affect blood pressure and pulse and also muscular contractions; the pancreas (special parts called Islets of Langerhans), which produces insulin essential in carbohydrate utilization; and the ovaries and testes, which produce, in turn, more hormones (estrogen, progesterone, testosterone, etc.) essential in the respective female and male functions of conception and reproduction. A delicate balance of effects and countereffects exists between the numerous hormones in maintaining normal health and function. Science and medical practice involving effects, deficiencies, and excesses of hormones is called endocrinology (*q.v.*), which is now one of the most important special fields in medicine.

Secretion in plants is the process of separating certain elements from the sap and elaborating them for particular uses. They are produced in the interior of the plants and are made up largely of those known as nutritious secretions, including sugar, starch, albumin, gum, gluten, and lignin. The special or nonassimilable secretions in plants include coloring matters, alkalies, acids, resinous substances, milks, and many others.

Secret Service (*sē′ķrĕt sẽr′vĭs*), the department of government which is concerned with the detection of crime and fraud, or with collecting information of a private nature for the benefit of a state or nation. In most countries the secret service is a distinct department of the government to counteract espionage, and the subordinates transmit reports from time to time either direct or through heads of departments to the chief official in this branch of the service. Although valuable services are rendered in discovering those who are disloyal or in breaking up unlawful organizations, the original purpose of the *U.S. Secret Service Division of the Treasury Department,* organized in 1864, was to detect counterfeiters of coins and paper currency and to co-operate in enforcing the revenue laws. Smuggling is another form of crime coming under the attention of the secret service. One of the best-known functions of the secret service is the protection of the President of the U.S. See also *Federal Bureau of Investigation.*

Sector (*sĕķ′tẽr*), the part of a circle included between two radii and their arc. The area of a circular sector is ½ the product of the radius and the arc expressed in radians. A spherical sector is that solid figure formed when a circular sector revolves about the diameter of the circle as an axis. The base of such a sector is the surface generated by the arc included between the two radii. The volume of a spherical sector is $\frac{1}{3}rS$, where r is the radius of the sphere and S is the area of the base.

Secular Games (*sĕķ′û-lẽr gāmz*), the name of a class of performances popular in ancient Rome, so named from a *saeculum,* meaning a generation or the extreme duration of human life. Originally these games took place at short intervals, but it was decreed in 249 B.C. that they should be celebrated every 100th year, and Augustus extended the period to 110 years. Three days were usually given to the games, but it was a part of the festivities to offer animals as sacrifices to Proserpina and Dis Pater, the gods of the lower world. The last celebration took place in A.D. 204, in the time of Septimius Severus.

Securities (*sê-ķū̆′rĭ-têz*), in commerce, investments showing the lawful ownership or share in a corporation or any other property, including bonds, stocks, mortgages, coupons, or certificates. According to the Securities Exchange Act of 1934, the term does not include "currency or any note, draft, bill of exchange, or banker's acceptance, which has a maturity at the time of issuance not exceeding nine months, exclusive of days of grace."

Securities and Exchange Commission (*sê-ķū̆′rĭ-têz and ĕķs-chānj′ ķŏm-ĭsh′ŭn*), or SEC, a quasi-judicial agency of the U.S. government, which administers regulations concerning securities. The SEC was formed in 1934 under the Securities Act. This act ruled that securities may not be offered for sale and distribution to the public (with certain exceptions) unless registered with the Commission. Registration is designed only to provide disclosure of facts upon which investors may judge of the merits of the securities being offered, the Commission having no power to deny registration for lack of merit. The act also contains prohibitions against misrepresentation, deceit, and other fraudulent practices, applicable to transactions in all securities, and gives the Commission certain policing powers to enforce such prohibitions.

The Securities Exchange Act, passed the following year, gave the Commission power of surveillance over the nation's securities exchanges and over-the-counter markets. Securities exchanges must register with the Commission, conform their practices to standards of the Act designed to protect the interest of investors and the public, and enforce fair practice rules upon their membership. Companies whose securities are listed upon exchanges must file periodic reports disclosing financial and other information of interest to investors. Solicitations of proxies from the holders of such securities must meet certain minimum disclosure requirements. The misuse by management and other officials of "inside" information is curbed by requirements for reporting of securities and related provisions.

The periodic reporting of information, proxy regulation, and related provisions do not apply to securities traded over the counter. In this field, brokers and dealers must register with the Commission and conform their business practices to the prescribed standards. Their national association, organized under the jurisdiction of the Commission, promotes establishment of fair trade practices among the membership and has disciplinary powers for misconduct.

The powers of the SEC were further extended by the Public Utility Holding Company Act of 1935. This act provides for Commission regulation of the financing and related policies of companies included within electric and gas utility holding-company systems, and over their purchases and sales of properties and securities. It also directs that systems be limited in their scope and operation to integrated units; that corporate complexities, including uneconomic capital structures, be simplified; and that inequitable distributions of voting power among different classes of security holders be corrected.

Subsequent laws extended the control of the SEC over companies engaged in the business of investing, reinvesting, and trading in securities, and over persons engaged in the business of advising others with respect to their securities investments, and have provided that the Commission serve as adviser to the U.S. district courts in cases concerning reorganization of corporations after bankruptcy.

Sedalia (*sê-dā'lĭ-ȧ*), county seat of Pettis County, Missouri, 88 m. S.E. of Kansas City, on the Missouri Pacific and the Missouri-Kansas-Texas R.R.'s. It is surrounded by a fertile farming country, which produces cereals, grasses, and fruits. Among the manufactures are glass blocks, prefabricated homes, shoes, mops and brooms, flour, furniture, soap, store fixtures, and truck bodies. Sedalia is the seat of the annual Missouri State Fair, whose harness races are an important tourist attraction. The town was founded by George R. Smith in 1857, on his land, and renamed Sedalia in 1861. It was chartered as a city in 1889. Population, 1950, 20,354.

Sedan (*sê-dăn'*), a city and fortress of France, in the department of Ardennes, 64 m. N.E. of Rheims. It occupies an imposing site on the Meuse River and in its vicinity are extensive deposits of coal and iron. Manufactures include cotton and woolen goods, metalware, pottery, and laces. Sedan is noted as a military and strategic point. It surrendered to the Germans in 1815 and again on Sept. 2, 1870. In the latter year a French army under Napoleon III and Marshal MacMahon made a stand there during the Franco-Prussian War. The German army under King William of Prussia laid siege to the city and on Sept. 1 began a vigorous attack, which resulted in the surrender of 82,000 men on the following day. Napoleon was sent as a prisoner of war to Wilhelmshöhe. This led to the fall of the Second Empire, upon the heels of which the republic of France was declared at Paris by Gambetta on Sept. 4. The *sedan chair* (a portable covered vehicle for carrying a single person, borne on two poles by two men) is said to have been invented in and named from the city of Sedan; hence, the derivation of the modern *sedan*, or closed motorcar.

Even though the fortifications of Sedan had been demolished, it figured as a battle site again in World War I. German troops occupied the town from 1914 till 1918, when the Allies, notably the American Rainbow Division and French forces, captured it from the Germans. World War II brought a new German attack on the French Maginot Line at Sedan, May 14, 1940. After a battle of two days, the German troops bypassed the fortifications (*q.v.*) at Sedan and swept into France. Population, *ca.* 17,000.

Sedatives (*sĕd'ȧ-tĭvz*), in medicine, the name applied to the general group of drugs which have a quieting or soothing effect by decreasing sensory and motor (activity) functions. The effect of such drugs is called *sedation,* wherein the patient is calm and quiet, but awake, as contrasted to the effect of the hypnotic and narcotic drugs which produce deep sleep or stupor. Sedation can be accomplished by small doses of narcotics such as morphine, demerol, or opium derivatives. This type of medication is usually given to quiet a patient before general anesthesia (ether, gas, chloroform, etc.). The commonly used sedatives, however, are the barbiturates (*q.v.*), bromides, chloral hydrate, paraldehyde, and related drugs.

Seder (*sā'dẽr*), Hebrew meaning "reading," the celebration held by the Jews in their homes on the first two nights of Passover (*q.v.*). The Haggadah, relating the story of Passover, is read on that occasion.

Sedge (*sĕj*), the common name of an extensive genus of plants, found mostly in swamps and wet places. They are generally distributed in all the temperate and northern parts of the earth. The stems are without joints, usually triangular, and possess little economic value. This genus of plants embraces the bulrushes and sedges proper, the latter being species of the genus *Carex.* A species of allied plants was used by the ancient Egyptians in making papyrus paper. The coarse fodder derived from the sedge plant is of no particular value for domestic animals, since only a few species eat it and even those partake of it reluctantly.

Sedgwick (*sĕj'wĭk*), ANNE DOUGLAS, author, born in Englewood, N.J., in 1873; died in 1935.

From the time she was 10, she lived abroad, chiefly in Paris and London. She studied painting in Paris (1891-96), but became interested in writing and soon published the first of a number of sensitive and distinguished novels, in many of which she described Americans abroad. Although her "Little French Girl" (1924) was probably the most successful of her novels, her books were consistently popular. Among her other works are: "Dull Miss Archinard" (1898), "Tante" (1911), "Adrienne Toner" (1922), "The Old Countess" (1927), and "Philippa" (1930). In 1908, she was married to Basil de Sélincourt.

Sedgwick, CATHERINE MARIA, author, born at Stockbridge, Mass., Dec. 28, 1789; died July 31, 1867. She opened a private school for young ladies in 1813, in which she remained a constant worker for 50 years. Her first book, "A New England Tale," was published in 1822 with the aid of her brother, Theodore Sedgwick. After this she gave her attention largely to literary work. A number of her writings were translated into European languages, including "Redwood," of which many editions were issued. Other books include: "Live and Let Live," "Facts and Fancies," "The Linwoods," "Letters to My Pupils," and "Letters from Abroad."

Sedgwick, JOHN, general, born in Cornwall, Conn., Sept. 13, 1813; slain in battle May 9, 1864. He was graduated from the West Point Military Acad., in 1837, and served against the Seminoles in Florida. His services were volunteered at the beginning of the Mexican War, in which he rendered valuable aid at Cerro Gordo, Contreras, Churubusco, and Chapultepec. In 1861, he was commissioned brigadier general of volunteers and was assigned to the Army of the Potomac. His efficient services in the Battle of Fair Oaks won the day for the Union army, and soon after he played a conspicuous part at Antietam. He was promoted to major general of volunteers in 1862 and fought at Fredericksburg, Chancellorsville, Gettysburg, Rappahannock, and in the Wilderness campaign. He was shot by a Confederate sharpshooter while placing guns in the entrenchments at Spottsylvania Courthouse. In 1868 a bronze statue of him was erected at the West Point Military Acad.

Sedgwick, ROBERT, American colonist and soldier, born in England, 1590; died in the West Indies, 1656. After emigrating to Charleston, Mass., in 1635, he joined in forming the Ancient and Honourable Artillery Company of Boston, becoming its commander in 1652. With John Winthrop, Jr., he helped to establish the first iron works in America, in 1643. He was made governor general of Jamaica, in the West Indies, living there until his death, in 1656.

Sedgwick, THEODORE, American jurist and legislator, born in Hartford, Conn., in 1746; died in Boston, in 1813. After his graduation from Yale, Sedgwick began the practice of law, joining the Continental Army at the beginning of the Revolution. He was in the Continental Congress from 1785-86; a Representative to Congress from 1789-96; and U.S. Senator from 1797-99, being president pro tempore in 1797. He then returned to the House of Representatives, being Speaker from 1799-1801. From 1802 until his death he was a justice of the Massachusetts supreme court.

Seeckt (*sākt*), HANS VON, general, born in Germany in 1866; died in 1936. Von Seeckt played an important part in World War I, acting as chief of staff for August von Mackensen's forces on the German eastern front (1915-16) and in the same capacity for the Turkish field army (1917-18). After Germany's surrender he became commander-in-chief of the *Reichswehr* (1918-26), creating an efficient nucleus of the later re-established German army. How far the terms of the Treaty of Versailles were violated under his responsibility has never been clearly established. Afterward he went to China as military adviser (1932-35) to Generalissimo Chiang Kai-shek for the reorganization of the Chinese army. He is also well known as the author of a number of brilliant military treatises.

Seed (*sēd*), a fertilized, matured ovule developed in the ovary at the base of a flower, consisting of an embryo, or minute plant, usually with a supply of food for its early growth, the whole surrounded by a protective covering or coat. Seeds vary greatly in shape, in size—from the dustlike orchid seed to the great coconut—and in their means of dispersal, which may be by wind, by water, by their being carried away by birds, animals, or insects and by other means. They are of high economic importance, and are extensively cultivated to be eaten as food by man and domestic animals or to propagate field, fruit, flower, forest, and vegetable crops.

Until approximately a century ago, the U.S. was largely dependent for seed on exchanges between neighboring farmers and on importations, chiefly from England and France, which were distributed by dealers in the Eastern ports of Boston, New York, and Philadelphia. Then, with the growth of cities and towns, as farmers extended their operations to provide food for the urban populations, the seed industry increased proportionately. Crops were grown especially for seed, particularly of varieties which were best adapted to prevailing conditions of soil and climate. This expansion has continued so that from this country seeds are now being exported to all parts of the world.

With the growth of the industry, seedsmen began to specialize, some concentrating on the growing and processing of a few or many species, others on their distribution to farmers and gardeners. At present most of the wholesale growing is done in the West and Midwest, while the distributors or retail seedsmen have stores in most communities or sell by mail through the medium of illustrated catalogues. Behind the familiar package of seed lies a high degree of scientific knowledge and technical skill. The large wholesale growers retain plant breeders, both to develop new and better varieties and also to prevent their standard stocks from reverting to the older, less desirable forms out of which they were selected or bred. Many of the new flower and vegetable varieties are submitted to the All-America Selections Council, for trial by its numerous judges in different areas, so that their value may be appraised before introduction to the public is considered. The vitality of seed offered for sale is checked by tests in germination laboratories, and samples are examined to make sure that weed seeds have been eliminated in the processes of cleaning carried on both by elaborate machinery and by hand at the wholesale warehouses. With the cooperation of the American Seed Trade Assn. and its members, the Federal Seed Law and various state laws have set up standards on both the foregoing points so that buyers may be assured of clean, high-germinating, true-to-type seeds, eliminating the wastefulness of weeds and the other risks involved in sowing unprocessed seeds.

Segment (*sĕg′mẹnt*), a line with finite limits or that part of a circle included between a chord and its intercepted arc. A spherical segment is that part of a sphere included between two parallel planes cutting the sphere. The bases are the circles formed by the intersection of the sphere and the planes. If one plane is tangent to the sphere, the segment is called a spherical segment of one base. The volume of a spherical segment of one base is $\pi h\ (3r^2 + h^2)\ /6$ where r is the radius of the base and h is the distance between the two planes.

Segregation (*sĕg-rē-gā′shŭn*), a term defining the isolation of certain groups of persons for sociological reasons. In the U.S., it means primarily the separation of Negroes from the rest of the community either by law, as in the Southern states, or by custom, as is common throughout the country; in the Republic of South Africa it is known as apartheid and is imposed by law requiring the separation, each from the others, of the various races and mixtures of races comprising the total population. Theoretically, advancement of an individual within his group is not hindered; however, limitations on opportunity have tended to retard the individual as well as the group.

Contrary to popular belief, segregation in the U.S. is not so old as the Republic. In the South where the system is most revered, Negro and white have had a long history of close proximity. The purpose of segregation in the U.S. has often been ascribed to the desire of certain groups to maintain a caste system, with the Negro permanently assigned to a lower status. This system was firmly entrenched under slavery (*q.v.*). Following the abolition of slavery, the first segregation laws were not passed in Southern states until the late 1880's; it was not until the 1890's that Virginia, North Carolina, and South Carolina adopted such laws.

INTEGRATION BREAKTHROUGH

One of the stormiest and most significant events in the history of the struggle against racial segregation in the South was the registration of James H. Meredith at the Univ. of Mississippi on Oct. 1, 1962. He is shown here (*left*) being barred by Gov. Ross R. Barnett (*right, wearing glasses*). A night of rioting followed, during which two persons were killed and some 60 injured as Federal troops and National Guardsmen fought to restore order. Meredith finally was enrolled under the protection of U.S. marshals

In 1896 the Supreme Court held, in the historic *Plessy vs. Ferguson* case, that a state could constitutionally require separation of the races provided equal facilities were available to both races. Although whittled away by successive legal action, the ruling remained substantially in force until May 17, 1954, when the Supreme Court handed down a unanimous decision which concluded "that in the field of public education the doctrine of 'separate but equal' has no place. Separate educational facilities are inherently unequal."

The decision was amplified by a series of Supreme Court rulings which extended the concept to transportation, recreation, and other public facilities. Prior to the 1954 ruling, 17 Southern and border states and the District of Columbia required separate schools for white and Negro children. In the 1962-63 school year, complete segregation in public education was maintained only in Alabama and South Carolina, and, in elementary and secondary schools, in Mississippi.

In the North, the core of the segregation issue lies in the area of housing. Statutory segregation is forbidden in practically all non-Southern states. Because of residential segregation, however, Negroes in large cities face considerable *de facto* segregation in schools and other public areas. In 1962 President Kennedy issued an executive order banning racial discrimination in the sale or rental of Federally assisted housing. Previously 18 states, the Virgin Islands, and 49 municipalities had enacted legislation prohibiting discrimination in some types of housing. See also *United States:* HISTORY.

Seidlitz Powders (*sĕd′lĭts pou′dẽrz*) a medical preparation named from the saline springs in Seidlitz, a village of Bohemia, used as an agreeable and effective aperient. These powders consist of 35 grains of powdered tartaric acid, enclosed in white paper, and 40 grains of bicarbonate of soda and 120 grains of tartrate of soda and potash, in blue paper. The contents of the two papers are dissolved separately, each in a half tumbler of water, and the two are then poured together. Immediately an effervesence takes place, during which the mixture should be taken. Rochelle salt is a similar preparation and the two names are frequently interchanged.

Seine (*sān*), a river of France, which rises in the department of Côte d'Or, a short distance N.W. of Dijon, and after a course of 481 m. toward the northwest discharges into the English Channel. It flows through a highly fertile region and has a number of important tributaries, including the Oise, Marne, Aube, and Yonne Rivers. Many canals have been constructed to connect with the Seine, making it the basis of a large interior and foreign trade. The improvements from its mouth to Paris are particularly extensive, while Rouen has been made a seaport by deepening its channel and constructing immense wharves. Among the principal cities on the Seine are Paris, Le Havre, Rouen, St.-Germain, Melun, and Fontainebleau. The basin has an area of 30,000 sq. m. It is navigable for a distance of 350 m. from its mouth.

Courtesy French Press & Information Service
ALONG THE SEINE RIVER IN PARIS, FRANCE

Seismograph (*sīs′mō-grȧf*), or SEISMOMETER, an instrument to indicate and record the motions on the surface of the earth during an earthquake. Various instruments are made for this purpose, including the *seismoscope,* which merely leaves a record of the tremor of the earth, either with or without indicating its time. However, the seismograph, or seismometer, records the direction, period, and extent of the shock. Most instruments of this class have an index, which is set in motion by the shock, thus tracing the horizontal and vertical movements on smoked glass or a similarly blackened surface. The newer instruments contain electrical or pendulum mechanisms, which are set in motion by the movements, and are sufficiently sensitive to record exceedingly mild tremors which are photographically recorded. They not only indicate the vertical and the horizontal movements, but record each shock, the direction, the maximum intensity, and the duration of each movement.

In recent years the principle of the seismograph has been adapted successfully for use in mineral exploration, particularly in petroleum prospecting. By creating and recording artificial earthquakes, the structure of subsurface strata can be mapped with considerable accuracy, thus helping to locate favorable sites for exploratory drilling. See also *Earthquake.*

Seismology (*sīz-mŏl′ō-jĭ*), that branch of physical science concerned with the study and investigation of earthquakes, their causes and effects, their distribution, and the various circumstances attending their occurrence. See *Earthquake; Seismograph.*

Sejanus (*sē-jān′ŭs*). See *Tiberius.*

Selective Service (*sē-lĕk′tĭv sẽr′vĭs*). See *Draft.*

Selene (*sē-lē′nē*), in Greek mythology, the daughter of Hyperion and Theia, sister of Helios and Eos, and worshiped as the goddess of the moon. Some writers identify her with Phoebe, the moon goddess; in later times she was associated with Artemis. She is represented in statuary as driving across the heavens in a chariot to bring light to men. White horses or cows draw her chariot and in some instances her symbol, the crescent moon, is borne in a conspicuous place.

Selenium (*sē-lē′nĭ-ŭm*), a nonmetallic element classed immediately between sulfur and tellurium. It was discovered in Switzerland by Jöns Jakob Berzelius (1779-1848) in 1817. Selenium is a rare element, occurring in composition with other minerals, especially silver, gold, copper, bismuth, and lead, but small quantities have been found in a free state in Mexico. When oxidized and dissolved by nitric acid, it yields *selenious acid.* It is obtained as a dark-brown, vitreous and amorphous modification, or as a lead-gray crystalline mass, and is noteworthy in that its resistance to electricity is less in light than in the dark, therefore it is used to transmit electric currents by means of light or vice versa, as in radiophotography, or in the photoelectric cell. Tellurium is a nonmetallic element of the same group as selenium. It is of rare occurrence and is found either native or in combination with metals. The resistance to electricity is similar to but less marked than that of selenium.

Seleucia (*sē-lū'shĭ-ȧ*), the name of seven cities in Asia, all of which were built in the early history of the dynasty of Seleucidae. Two of these were particularly famous, for both their commercial importance and political power. The earliest was *Seleucia Pieria,* founded by Seleucus Nicator in 300 B.C. It was situated near the mouth of the Orontes, 12 m. w. of Antioch, of which it was the seaport. During the war between the Ptolemies and the Seleucidae for predominance in Syria it formed an important strategic point, but with the rise of Roman power it declined rapidly. The excellent port is still in a fair state of preservation, but the walls, temples, amphitheaters, and citadel are in ruins or entirely destroyed. The only connection between the city and the sea was a channel cut through the solid rock, having a length of 1,087 yds.

Seleucia-on-the-Tigris was the most celebrated of these cities, being for many years the eastern capital of the Seleucidae. It was founded by Seleucus Nicator about 35 m. N.E. of Babylon and was built largely of material taken from the latter city after its downfall. Its growth was remarkable. In its greatest prosperity it had about 600,000 inhabitants and formed the most important commercial center of Asia even to the time of Strabo. When Western Asia was conquered by the Romans, it was finally burned by Trajan in 116 A.D. At the time Emperor Julian made his expedition to the East he found the city entirely destroyed, and the country surrounding its ruins was the haunt of wild beasts.

Seleucidae (*sē-lū'sĭ-dē*), the dynasty of kings that succeeded Alexander the Great in governing a large part of Western Asia. Their dominion included Syria, portions of Asia Minor, and the Eastern Provinces. The dynasty was founded by *Seleucus Nicator* (358-280 B.C.), who was a general under Alexander the Great, and after the death of the latter became satrap of Babylonia. A misunderstanding between him and Antigonus caused him to take refuge in Egypt in 316 B.C., where he secured assistance from Ptolemy, governor of Egypt, in taking the field against Antigonus, and he finally return to his satrapy in 312 B.C. He conquered Media soon after and assumed the title of *Seleucus I* in 306 B.C., thus founding the dynasty. He rapidly extended the borders of the kingdom from the Indus to the Oxus River. Four years later he formed an alliance with Ptolemy, Cassander, and Lysimachus against Antigonus, defeating the latter at Ipsus in 301 B.C., and the general division of territory secured Syria and portions of Asia Minor, but with the death of Lysimachus, King of Thrace, he annexed all of Asia Minor.

Seleucus I was assassinated in 280 B.C. by Ptolemy Ceraunus and was succeeded by his son, Antiochus I. This king was victorious against the Gauls, who had invaded Asia Minor, but was killed in battle in 261 B.C. He was succeeded by a number of kings bearing the name of Antiochus, Seleucus, and Demetrius, but of these Antiochus III, surnamed *The Great,* was the most noted. He was the first to come into collision with the Romans, but was defeated by Acilius Glabrio at Thermopylae in 191 B.C. and soon after by Scipio. From that time the power of the Seleucidae declined rapidly, weakened by the loss of the kingdoms of Bactria, Armenia, Parthia, and Judea, and the last small remnant was made a Roman province by Cneius Pompeius in 65 B.C.

Seleucus (*sē-lū'kŭs*). See *Seleucidae.*

Self-Defense (*sĕlf-dē-fĕns'*), a term in criminal law applied to the right of a person, based on the natural law of self-preservation, to protect himself or his property against an attempted injury by another person.

Selim I (*sē'līm*), Sultan of Turkey, son of Bajazet II, born in 1467; died Sept. 22, 1520. He was of a warlike disposition and secured the support of the Janizaries, with whose aid he dethroned his father and became monarch on Apr. 25, 1512. It was his policy to remove every possible threat to his power and to that end he caused the death of his father, brothers, nephews, and many others who might possibly aspire to the throne. He declared war against Persia in 1514. In the same year he invaded that country with an army of 250,000 men and, after defeating Shah Ismail at Chalderon, annexed Kurdistan and Diarbekir to his dominion. He left a part of his army in Asia and invaded Egypt, where he defeated the forces of the Mamelukes.

The victorious army of Selim I entered Cairo in 1517, where his chief opponents were put to death, and Egypt was incorporated into the Ottoman Empire. The last descendant of the Abassid caliphs of Egypt bestowed upon him the title of Iman and the standard of the prophet, and in consequence the Ottoman Sultan of Constantinople became the chief of Islam, as the legal representative of Mohammed. This distinction was soon after recognized by the sacred cities of Medina and Mecca, and his supremacy was acknowledged by the leading Persian chiefs. Though a fierce and cruel warrior, Selim was noted as a patron of literature and art. During his reign a powerful navy was built, the Janizaries were controlled, and Turkish rule was extended more than during the reign of any of his predecessors. He was succeeded by Solyman I.

Selim III, Sultan of Turkey, son of Mustapha III, born Dec. 14, 1761; assassinated in 1808. He succeeded to the throne after the death of his uncle Abdul-Hamid, in 1789, and immediately adopted a progressive policy, but his plans were disturbed by wars with Russia and Austria in Europe and with the French in Egypt. Austria compelled him to cede Choczim in 1791, and Russia obtained all his possessions beyond the Dniester by the Peace of Jassy in 1792. His progressive plans for clothing, arming, and disciplining his troops in the European fashion caused the dervishes openly to preach revolt, charging Selim with despising the holy injunctions of the Koran, and he was finally deposed by the Janizaries in 1807. In his reign many factories were established and internal improvements were fostered, but an organized attempt to reinstate him on the throne in 1808 was the immediate cause of his being assassinated.

Selinus (*sē-lī'nŭs*), an ancient city on the southwestern coast of Sicily, founded by a colony of Greeks about 630 B.C. The Athenians sent an expedition to Selinus in 415 B.C., because of wars with natives of the island. An army of Carthaginians intervened in behalf of the natives in 409 B.C., and many inhabitants were killed or carried away as slaves. In the First Punic War, about 250 B.C., the city was entirely destroyed and was never rebuilt. Ruins of large Greek temples are still extant, including one about 370 ft. long and 177 ft. wide. This structure was consecrated to Apollo and contained many sculptures. Several fine specimens of the latter are now in the museums of Palermo.

Seljuks (*sĕl'jōōks*), or SELJOOKS, the name of several Turkish dynasties, which were descended from one family and governed large parts of Asia from the 11th to the 13th centuries. The dynasty was so named from Seljuk, a chief of a small tribe of Bokhara and the surrounding country, in the early part of the 11th century. His grandson, Togrul Beg, became the chief of a tribe that had migrated to northern Khorasan and established his government at Nishapur. He subdued Balkh and Khaurezm in 1041 and Bagdad in 1055, and became the reigning monarch at the last-mentioned city. Togrul Beg was a warm supporter of the Moslem faith and built numerous mosques and supported pious and learned men. In 1063, he was succeeded as ruler of Persia, by his nephew, Alp Arslan, who conquered Palestine and Syria from the caliphs of Egypt and in 1071 made Diogenes, the Byzantine Emperor, a prisoner. As a ransom for Diogenes, he received a large part of Asia Minor.

Alp Arslan was succeeded by his son, Melek Shah (1073-93), the most powerful of the Seljuk monarchs. He not only solidified the empire, but annexed all of Asia Minor and Arabia, thus controlling the extensive region lying between Chinese Tartary and the Hellespont. His reign was aided by the influence of his grand vizier, Nizam-ul-Mulk, who is noted for his progressive scholarship and support of learning. Many bridges, canals, highways, hospitals, and colleges at Herat, Basra, Ispahan, and Bagdad attest the progressive spirit of that epoch. Smaller kingdoms began to form after the death of Melek Shah. The foundation for these had been laid by that ruler, since he established a number of principalities that were professedly subject to the center state of Iran or Bagdad. Saladin was one of the Seljuk chiefs and as such came in contact with the Crusaders. Others like him began to assert their power until finally the monarchy was dissolved. The Mongols under Genghis Khan pressed the Mohammedans toward the west and their dominion at length fell entirely, the Seljuk dynasty ending with Kaikobad in 1315. The Seljuks were succeeded by the Ottoman princes, both of whom were Turks, and thus the foundation for the Turkish or Ottoman Empire was laid.

Selkirk (*sĕl'kẽrk*), ALEXANDER, the prototype of Robinson Crusoe, born in Largo, Scotland, in 1676; died in 1721. He was the son of a shoemaker and tanner, whose name was Selcraig, and at an early age left home to go to sea. In 1703, he went on a privateer to the South Seas, and, being of a quarrelsome disposition, disagreed with his captain. In October of the same year he was marooned on the island of Juan Fernandez, where he remained a solitary resident for four years and four months, when he was rescued by Capt. Woodes Rogers, who made him commander of a privateering vessel. He returned to Scotland in 1712, but again went to sea, rising to the rank of lieutenant in the navy. A statue has been erected to his memory in his native town. Daniel Defoe made famous the experiences of Selkirk by his "Robinson Crusoe," which he published in 1719, but the book contains many experiences drawn from imagination. See *Juan Fernandez.*

Selkirk Mountains (*sĕl'kẽrk moun'tĭnz*), an elevated mountain range in southeastern British Columbia. The range is about 175 m. long by 80 m. wide, and lies immediately west of the Rocky Mts. proper. Mt. Sir Donald, height 10,808 ft., is the culminating peak. The Canadian Pacific R.R. crosses the range through Rogers Pass, at an altitude of 4,300 ft. It has an abundance of valuable timber to a height of nearly 6,000 ft., but snow lies perpetually on the elevations exceeding 7,000 ft. The presence of vast snow deposits gives rise to large glaciers, which in former times were even more extensive than at present, a fact evidenced by numerous moraines.

Selma (*sĕl'mȧ*), county seat of Dallas County, Alabama, on the Alabama River, approximately 41 m. w. of Montgomery. It is at the head of navigation on the Alabama River, and is served by the Louisville & Nashville, the Southern, and the Western of Alabama R.R.'s. The airport at Craig Field, a permanent part of the U.S. Air Univ., is 4 m. S.E. of the city. Selma is located in the center of the Clover Lime Belt, a rich agricultural area, and is an important distributing point and agricultural center. Among the manufactures are cigars, clothing, fertilizer, bags, lumber, bricks, cottonseed oil products, compresses, candy, lawnmowers, mattresses, and shovel handles.

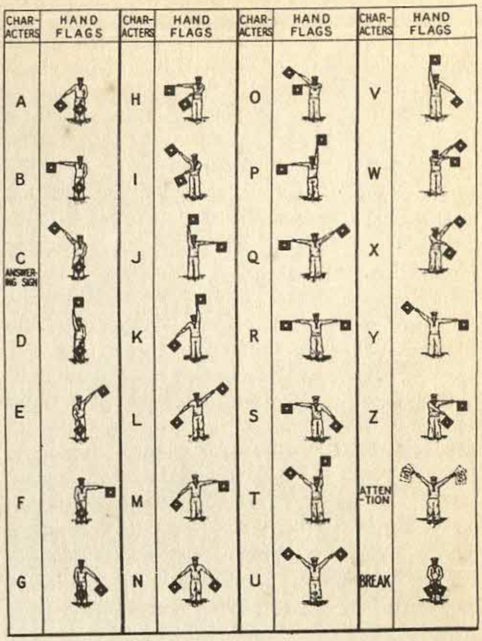
Noteworthy structures include the Burns-Bennett-Bell House, the John Tyler Morgan House, the Pettus House, and the Philpot House, all built in the early 19th century; the site of the Confederate Arsenal; and the Naval Foundry Monument on the site of a Confederate navy yard.

Originally known as Ecor Bienville in 1732, it later became known as Moore's Bluff, and was incorporated in 1820. William Rufus King, later Vice President of the U.S., named the town "Selma," for a place-name in the "Celtic" poems of Ossian. On April 2, 1865, during the Civil War, Selma was captured by the Federal commander, Gen. Wilson, and was partially destroyed. Population, 1940, 19,834; in 1950, 22,840.

Selvas (*sĕl'vȧz*), the name applied to the forest regions of South America, especially to the timbered plains of the Amazon Basin. They are located in a vast extent of country where rainfall is abundant, and are characterized by many climbing plants and a great variety of large trees. India rubber, lumber, and medicinal barks are obtainable in large quantities, but the greater part of these forests has not been utilized and is still in a primeval condition. The region as a whole contains some of the largest and most valuable forests in the world.

Selznick (*sĕlz'nĭk*), DAVID OLIVER, motion-picture producer, born in Pittsburgh, Pa., May 10, 1902. He entered the motion-picture business in 1920 as an employee of Select Pictures, subsequently working for Metro-Goldwyn-Mayer, Paramount and RKO-Radio Pictures. In 1936 he organized his own company, Selznick International Pictures. This company was later dissolved, when he founded Vanguard Films. Successful motion pictures he has produced include "Dinner at Eight," "David Copperfield," "Anna Karenina," "A Tale of Two Cities," "Nothing Sacred," "The Adventures of Tom Sawyer," "Rebecca," "Gone With the Wind," which he himself considers his masterpiece, and "Since You Went Away," the Motion Picture Academy Award film of 1946.

Semaphore (*sĕm'ȧ-fōr*), an apparatus for giving signals by lanterns, flags, and oscillating arms. Signals of this kind were formerly common, but they have been largely superseded by the use of electrical communication. Semaphore signals are still used by naval forces, however, and railways still employ semaphore signals of various kinds. These consist of posts from 10 to 20 ft. in height, at the top of which are two forms of arms, one being notched and the other square-ended. The latter are painted red on the side toward the trains they signal and white on the other side, and at night red or white lights are used for the same purpose. In most cases the red signal indicates danger, and thus the engineer is cautioned either to stop or to run slowly. The white signal, or light, indicates that the train is to proceed without stopping. In some cases the arm is dropped to indicate a clear track, is raised to an angle of 45° to signify caution, and is elevated to a horizontal position as a signal that the train is to stop. For semaphore signaling by flag (naval use), see *Morse, Samuel F. B.; Wigwag;* and color plate, *Means of Communication I,* in Volume II.



Courtesy U. S. Coast Guard

SEMAPHORE ALPHABET

Sembrich (*zĕm'brĭk*), MARCELLA, opera singer, born at Wisniewczyk, Galicia, near Lemberg, Austria, Feb. 15, 1858; died in New York City, Jan. 11, 1935. Her parents were natives of Galicia and her real name was Praxede Marcelline Kochanska. For some time she studied the piano and the violin, but later found that she was far more gifted as a singer than as an instrumentalist. In 1877, she made her debut in Athens, Greece, and soon appeared successfully in Dresden. She sang in the leading cities of Europe for a number of years and several times visited America, attaining her greatest successes in the characters of *Lucia, Violetta, Rosina,* and *Gilda.* She sang with the Metropolitan Opera in New York from 1898 until 1909. From 1924, she served as director of the vocal department of the Curtis Inst. in Philadelphia.

Semele (*sĕm′ẹ-lē*), in Greek legends, a beautiful princess, the daughter of Cadmus, King of Phoenicia. She became noted because of the affection bestowed upon her by Zeus. Hera, the haughty queen of heaven, was jealous of her, and artfully persuaded her to insist upon Zeus visiting her in all his power and glory, well knowing that this would cause her instant death. When asked to grant a request, Zeus vowed by the Styx that he would accede to her wishes whatever they might be. Semele begged of Zeus to appear to her in all the glory of his divine power and majesty, and, having vowed to do so, he was compelled to grant her wish, but she was immediately consumed in the flames of the lightning. However, her son by Zeus, who was called Dionysus, was saved and became the god of wine.

Semen (*sē′mẹn*), the fluid secretion of the male testicles containing the spermatozoa which fertilize the female egg.

Seminoles (*sĕm′ĭ-nōlz*), a Muskhogean Indian tribe of Florida consisting of descendants of the Creek and Hitchiti peoples who moved into Florida from Georgia about 1750. There was a second migration in 1778 and a much greater one after the Creek-American war of 1813-14. Many escaped Negro slaves joined the Indians at that time. In the War of 1812, while under Spanish rule, they fought against the U.S. Later there were two wars with the whites. The first was in 1817-18, and the American forces were under the command of Gen. Andrew Jackson. This resulted in the ceding of Florida to the U.S. by Spain. The second was caused by the refusal of the Indians to recognize the treaty providing for their removal beyond the Mississippi and lasted from 1835 to 1842. After their defeat, a great part of the hostile Indians were removed to Oklahoma. This second contest is particularly noteworthy because of its length and cost and the personality of Osceola, the Seminole leader. The Indians taken to Oklahoma were subsequently organized into the "Seminole Nation" as one of the Five Civilized Tribes. The small number remaining in Florida continued to live in the Everglades area, where there are three reservations. There are now about 800 of the Seminoles in Florida and 2,560 in Oklahoma. The latter live for the most part on allotted lands as there is no reservation.

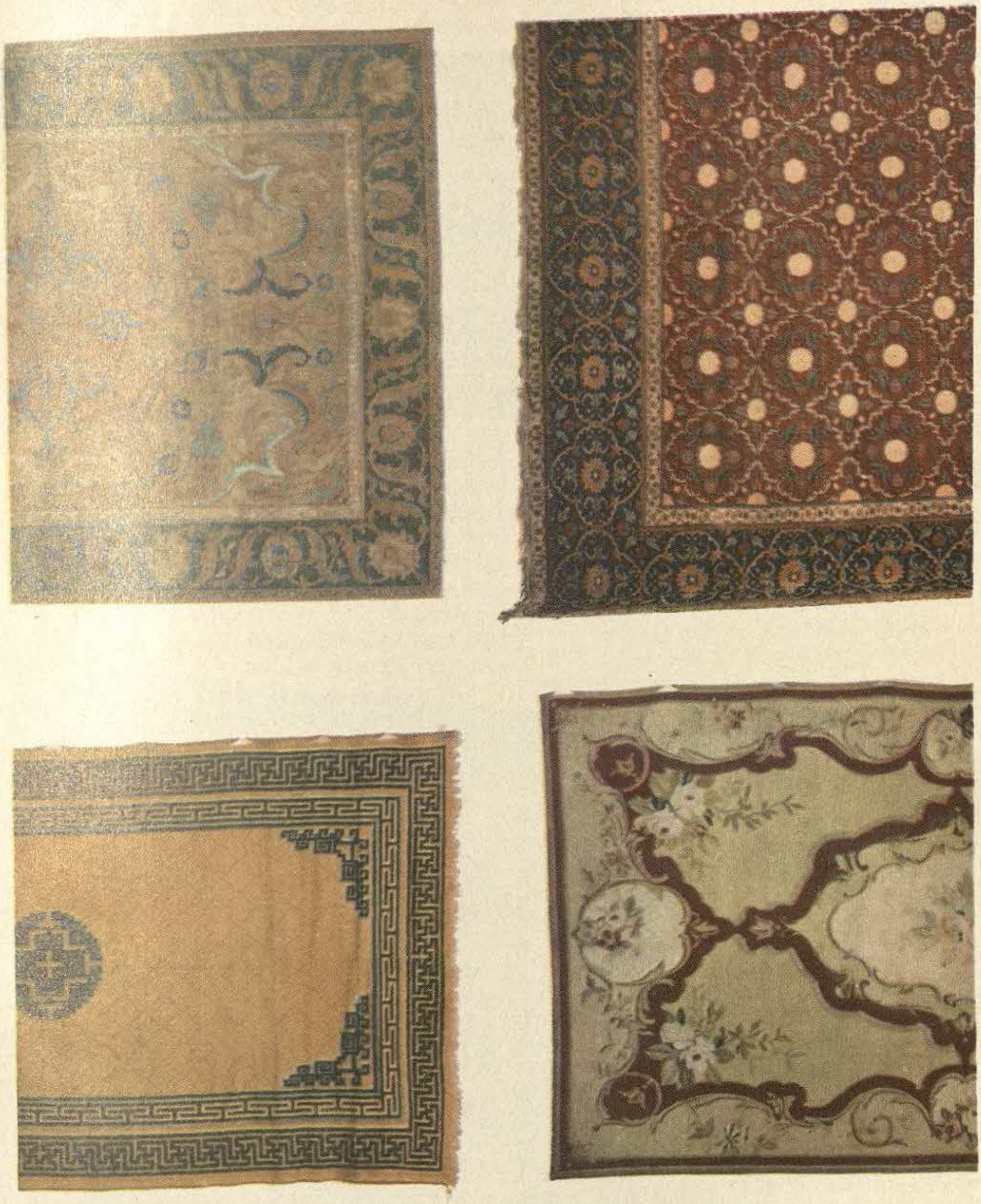
Semiramis (*sē-mĭr′ȧ-mĭs*), a legendary queen of Assyria and Babylonia, reputed one of the most powerful rulers of Asia. Tradition makes her a daughter of Derceto, the fish goddess of Ascalon, and of a Syrian youth. Onnes, governor of Nineveh, was attracted by her beauty and made her his wife, but she won the love of King Ninus by a heroic exploit, the capture of Bactria, which had defied the forces of the king. Onnes hanged himself to give Semiramis freedom to become the wife of Ninus, but that ruler died soon and she was proclaimed Queen of Assyria, ruling over that mighty empire for 42 years. She traveled in all parts of her dominion, founded Babylon, and made it the most powerful city in the world. In her reign stupendous monuments were built, and large regions were added to the empire, particularly Libya, Persia, and Ethiopia. The Hanging Gardens of Babylon are attributed to her time, and there are other antiquities that give evidence of her long and successful reign. She was succeeded by her son, Ninyas. According to tradition, she disappeared after assuming the form of a dove and was long worshiped as a deity. If there is any historical basis for the figure of this princess, she might have lived in the first millennium B.C.

Semites (*sĕm′īts*), the name of a group of nations, once thought to be closely allied in physical features, language, and religion, and regarded as the descendants of Shem, a son of Noah. The name was formerly applied to the various peoples native to Arabia, Syria, Chaldæa, Abyssina, Phoenicia, Ethiopia, and Palestine. It is generally assumed that the first representatives were confined to Arabia about 4000 B.C., where they led a nomadic life, but later migrated into Mesopotamia. After dwelling for some time under the priest government of the Turanians then occupying that region, they became identified with the ruling classes, and finally spread over large parts of Western Asia and Northern Africa. The cities of Tyre and Sidon are among the many commercial centers founded by Semites, and for centuries they were the predominating power of that region of the world.

Properly there are four divisions of the ancient dialects, generally known as the *eastern,* including Babylonian and Assyrian; *central,* including Syriac and Aramaic; *western,* including Phoenician, Moabite, Canaanite, and Hebrew; and *southern,* including Arabic and Ethiopic. Ethiopic was formerly the language of Abyssinia, but it has given way to Amharic and other modern tongues. The Arabic language is used most extensively of the Semitic tongues and includes about 40 dialects. Among the marked peculiarities of the Semitic languages is the triliterality of the roots, these consisting of three consonants, and the inflection by means of internal vowel change. It is peculiar for its absence of compound words.

The Semitic people are distinguished for their worship of one god. They are the early teach-

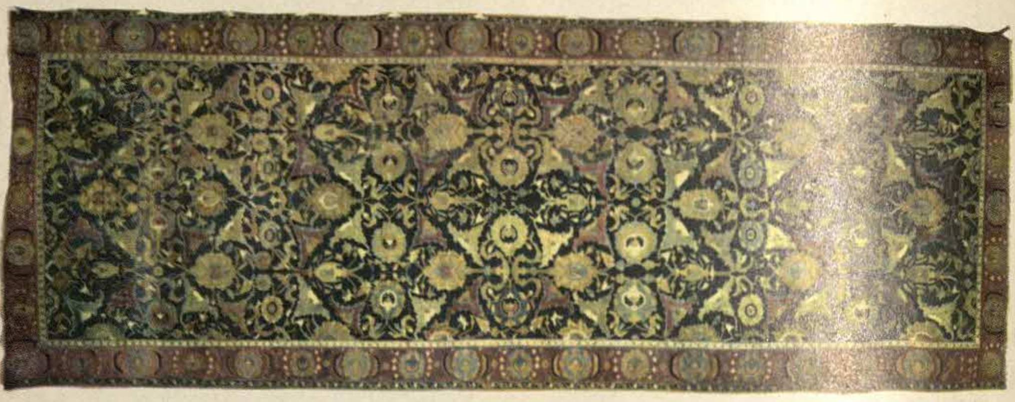
ANTIQUE RUGS



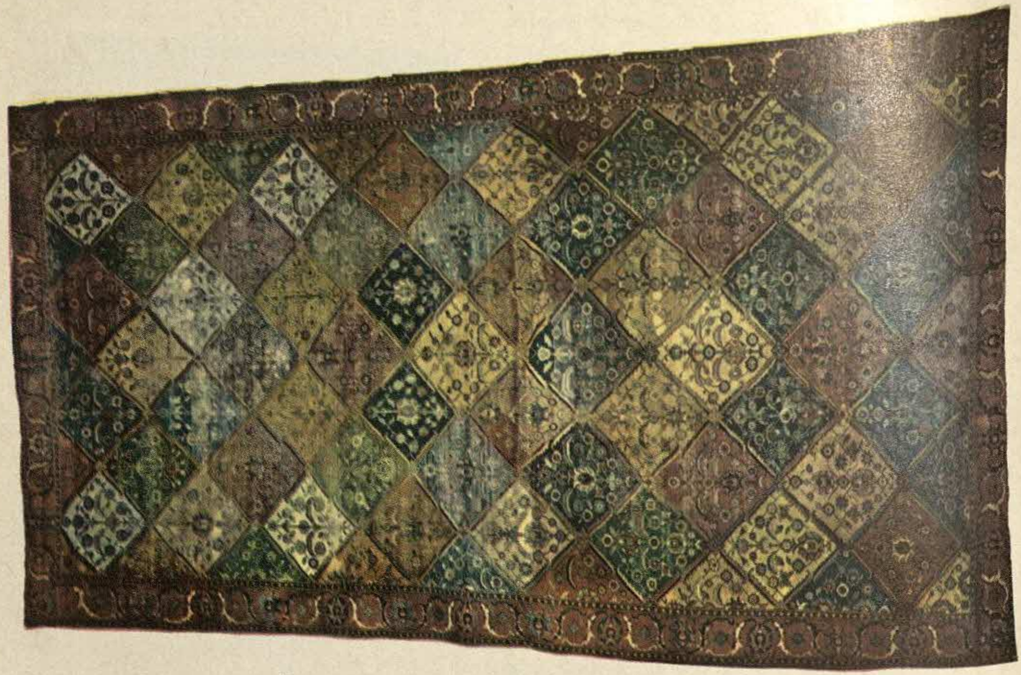
Top to bottom, left to right: Persian Rug, so-called "Polonaise," early 17th century. Indian red ground Rug woven on the royal looms of Jaipur, early 17th century. Chinese Rug, 17th century. French Aubusson Rug, early 19th century.

Courtesy French & Co., Inc., New York

ANTIQUE PERSIAN RUGS



Persian Harat Rug, so-called "Ispahan," early 17th century



Persian garden Rug, early 17th century

Courtesy French & Co., Inc., New York

ers of three monotheistic religions, namely, the Jewish, Christian, and Mohammedan. Through them the Bible and the Koran were given to the world. They distinguished themselves in literature, arts, and many of the sciences. It was from Phoenicia that commerce and western colonization spread, while the powerful Carthaginian empire sent forth its Hannibal, and the Babylonians and Assyrians reared mighty empires and cities of great wealth. The Phoenician alphabet is not the oldest, but from it came most of the alphabets of Asia and Europe, while the system of notation in common use is from the Hindus. To the Arabs must this and the preservation of much other learning be credited while the Dark Ages spread their shadow over Europe.

Semmelweiss (*zĕm′ẹl-vīs*), IGNAZ PHILIPP, obstetrician, born in Budapest, Hungary, July 1, 1818; died Aug. 17, 1865. As an obstetrical assistant in the General Hospital in Vienna, Semmelweiss enforced sanitary precautions in delivery rooms and reduced childbirth mortality rates from 9.92 to 1.27 in less than two years (1847-49), thus proving that puerperal fever (*q.v.*) is infectious.

Semmes (*sĕmz*), RAPHAEL, naval officer, born in Charles County, Maryland, Sept. 27, 1809; died Aug. 30, 1877. He studied law and entered the navy. He took part in the Mexican War and served as secretary of the lighthouse board, 1859-61. At the beginning of the Civil War he became commander of the steamer *Sumter* of the Confederate navy. With it he captured 18 merchantmen and sailed to Europe, but the U.S.S. *Tuscarora* pursued and finally blockaded him at Tangier, Morocco. He sold his ship to evade capture, and, in 1863, returned to the U.S. in command of the famous *Alabama*, a steamer built and manned in England (see *Alabama Claims*). With that vessel he captured 62 merchant vessels and destroyed the gunboat U.S.S. *Hatteras* off Galveston, but was pursued by the *Kearsarge* and his vessel was sunk off the harbor of Cherbourg, France, June 19, 1864. He escaped on a British vessel and returned to the U.S., was soon after made rear admiral in the Confederate navy, and commanded the water approaches to Richmond. In 1865, he joined Gen. Johnston in the capitulation of Greensboro, N.C. He was arrested at Mobile (1865) for his part in the war, but was released after several months' imprisonment. Afterward he became editor of a daily paper at Mobile and later was professor in the Louisiana Military Inst. at New Orleans. Among his publications are "Memoir of Service Afloat During the War Between the States" and "The Cruise of the *Alabama* and the *Sumter*."

Sempach (*zĕm′päḳ*), a town of Switzerland, in the canton of Lucerne, on the east shore of Lake Sempach. It would be of little more than local interest but for the historic battle that occurred here on July 9, 1386, in which the Swiss gained a decisive victory over the Austrians. The Swiss army of 1,300 was under command of Arnold von Winkelried and the Austrian army of 5,400 was under Duke Leopold. The Swiss army made a desperate attack and totally defeated the Austrians, who lost 2,000 troops and 600 nobles, while the Swiss lost only 200 men. A chapel marks the site of the battlefield. The anniversary of this battle is still celebrated in Switzerland. Population, *ca.* 1,250.

Photo by Franz Schneider

SEMPACH STREET SCENE

Semper Paratus (*sĕm′pĕr pä-rä′tŭs*), Latin, meaning "always prepared," historic motto of the U.S. Coast Guard.

Sen (*sĕn*). See *Coin*.

Senate (*sĕn′ĭt*), the deliberative assembly of the Roman people. Originally it was composed of 100 members, each representing one of the *decuriae* into which the body of the Roman citizens was divided, at the time they comprehended the single tribe known as the Ramnenses. With these the Sabines were incorporated as a second tribe, hence an equal number of senators was added. When the third tribe, the Lucerenses, was added, the number was increased to 300. Subsequently the number varied greatly, exceeding 1,000 during the second triumvirate, but Augustus reduced it to 600. The senators held office for life. They were elected by the *decuriae* during the kingly period; by the consuls and consular tribunes, under the republic; and by the censors, after the establishment of the censorship. The plebeians as an order were never eligible, but they frequently attained to the senatorial dignity after the quaestorship and curule magistracies were opened to them. Hence the senate, originally a purely aristocratic body, became gradually the real representative of the people. The term is applied to the upper branch of the legislature in many states and countries, as in France, the U.S., and some cantons of Switzerland.

Senate, UNITED STATES, one of the two branches of the U.S. Congress (*q.v.*). It consists of a fixed number of Senators, two from each state. The Vice President of the U.S. presides over the Senate and signs enrolled bills. The organization of the Senate is explained below; the various officers of the Senate and their functions are as follows:

The PRESIDENT PRO TEMPORE performs, in the absence of the Vice President, the duties of that office.

The SECRETARY OF THE SENATE is presiding officer in the absence of the Vice President and pending the election of a President *pro tempore;* is custodian of the seal; requisitions moneys appropriated for expenses of the Senate; administers oaths; certifies extracts from the Journal of the Senate; attests bills and joint, concurrent, and Senate resolutions; in impeachment trials may issue, under the authority of the Presiding Officer, all orders, mandates, writs, and precepts authorized by the Senate; certifies to the President of the United States ratification of treaties and the names of persons confirmed or rejected upon the nomination of the President.

The CHIEF CLERK has general supervision over the clerks under the jurisdiction of the Secretary and is Reading Clerk.

The PARLIAMENTARIAN indicates the reference of bills and Executive communications to committees, and furnishes precedents to the presiding officer and Senators concerning procedure.

The JOURNAL CLERK keeps the journal of the legislative and impeachment proceedings.

The ENROLLING CLERK has charge of the engrossment and enrollment of bills.

The EXECUTIVE CLERK keeps the journal of the Executive proceedings (relating to nominations and treaties).

The SUPERINTENDENT OF THE DOCUMENT ROOM has charge of the Senate Document Room.

The FINANCIAL CLERK disburses moneys appropriated for the Senate and keeps its financial records.

The LEGISLATIVE CLERK endorses action on bills and other papers presented to the Senate. He also prepares the legislative calendar and is assistant Reading Clerk.

The PRINTING CLERK has charge of all printing and binding for the Senate.

The LIBRARIAN has supervision over the Senate Library.

The KEEPER OF STATIONERY has charge of the stationery room of the Senate. He makes purchases and keeps accounts of Senators and committees.

THE SECRETARY TO THE MAJORITY is Majority Party Pair Clerk. He supervises all floor activities, including supervision of pages and the distribution of bills and amendments on the floor. He also receives messages from the President and the House of Representatives and attends to the calling of party conferences.

The ASSISTANT SECRETARY TO THE MAJORITY has charge of Majority pages. He keeps the record and calendar files of Majority Senators and distributes on the Senate floor bills and amendments. He also performs, in the absence of the Secretary to the Majority, certain duties of that office.

The SECRETARY TO THE MINORITY is Minority Party Pair Clerk, and, in the absence of the Secretary to the Majority, supervises all floor activities, including supervision of pages and distribution of bills and amendments on the floor. He receives messages from the President and the House of Representatives and attends to the calling of party conferences.

The ASSISTANT SECRETARY TO THE MINORITY has charge of Minority pages, keeps the record and calendar files of Minority Senators, and distributes on the Senate floor bills and amendments. He also performs, in the absence of the Secretary to the Minority, the duties of that office.

The CHAPLAIN offers prayer at the opening of the daily sessions of the Senate.

The OFFICIAL REPORTERS report stenographically the proceedings of the Senate.

The LEGISLATIVE COUNSEL assists Senate committees and Senators in the preparation and drafting of bills and committee reports.

The SERGEANT AT ARMS is Executive Officer of the Senate. He procures quorums, has charge of the Senate Galleries, oversees Gallery Doorkeepers, Capitol Police, and various subordinate officers of his department.

The DEPUTY SERGEANT AT ARMS performs, in the absence of the Sergeant at Arms, the duties of that office, and is also storekeeper. He keeps property records and is the purchasing agent.

The FOLDING ROOM is charged with the distribution of public documents by Senators.

The POST OFFICE receives and delivers mail for Senators and for officers and employees of the Senate.

The CAPITOL GUIDES are appointed by the Sergeants at Arms of the Senate and House of Representatives and are subject to the rules and regulations promulgated by the Capitol Police Board.

The CAPITOL POLICE are appointed by the Sergeants at Arms of the Senate and House of Representatives and are under the direction of the Capitol Police Board. It is their duty to police the Capitol Building and grounds.

The SENATE OFFICE BUILDING POLICE are appointed by the Sergeant at Arms to police the Senate Office Building.

Seneca (*sĕn'ē-ḳȧ*), LUCIUS ANNAEUS, philosopher and rhetorician, born in Cordova, Spain, in 3 B.C.; killed himself at Rome, Italy, in 65 A.D. He was the son of Annaeus Seneca (*ca.* 54 B.C.-*ca.* 39 A.D.), a celebrated rhetorician who taught rhetoric in Cordova and Rome. Seneca the Philosopher, as the younger was called, was taken at an early age to Rome, where he studied rhetoric, philosophy, and law. He afterward entered the practice of law and became so noted for his fluency that he attracted the unfavorable attention of the jealous Emperor Caligula, who was hindered from taking Seneca's life only by the assurance of the latter's friends that he had not long to live anyway. He rose to high favor with Emperor Claudius, but he was nonetheless

SENECA

banished to Corsica in 41 A.D. on a charge of intimacy with Julia, a niece of the emperor. Whether or not the charge was just has never been proved. In 49 Agrippina, mother of the future Emperor Nero, recalled him to the Roman capital to become the young boy's tutor. On Nero's ascent to the throne in 54 Seneca became one of his two chief counselors, but his influence had already suffered a considerable decline by the time his colleague, Afranius Burrus, died in 62, and the evidence is strong that Nero, despite protestations to the contrary, was only too happy to accept his resignation at that time. Seneca devoted the next years to study and writing, but in 65 he became implicated in the so-called Pisonian conspiracy, which aimed to murder Nero, and was condemned to death by the emperor. Although some authorities believe that Seneca had no knowledge of the plot, the consensus is that there can be no doubt whatever that he was involved in it. He died by cutting several veins in his arms and legs.

Seneca was the first Roman philosopher to preach the doctrines of Stoicism. He believed that the purpose of philosophy was to serve as an ethical guide for daily living, rather than simply as a theoretical search for basic truths. Thus, his most important writings are his ethical treatises: a series of essays on such subjects as "Anger," "Steadfastness of the Wise Man," "Providence," "Tranquillity of Mind" and "Clemency"; his "Letters to Lucilius," a group of 124 moral letters written during the last years of his life, and seven books entitled "Benefits." Other writings include "Consolatio ad Helviam," a letter of consolation addressed to his mother; "Consolatio ad Polybium," a letter consoling Polybius on the loss of his brother; seven books on "Investigations of Nature"; and nine tragedies.

Seneca Falls (*sĕn'ê-kȧ fạlz*), a village in Seneca County, New York, on the Seneca River, 10 m. N.E. of Geneva. It is on an arm of the New York State Barge Canal and the Lehigh Valley and the New York Central R.R.'s. The adjacent country is rich in grasses, fruits and cereals. In the vicinity are picturesque lakes and deposits of gypsum and building stone. The manufactures are machinery, lamps, cotton and woolen goods, and lumber products. The place was settled in 1791 and incorporated in 1831. The first Women's Rights Convention was held here in 1848. Population, 1900, 6,519; in 1940, 6,452; in 1950, 6,634.

Seneca Lake .(*lāk*), an elongated body of water in New York State, lying between the counties of Seneca, Ontario, Schuyler, and Yates. The length is 35 m.; width, from 1 to 4 m.; and elevation, 247 ft. above sea level. The greatest depth is 630 ft. and its shores are picturesque and in many places quite abrupt. It is important for its fisheries and navigation facilities, being connected with the New York State Barge Canal by the Seneca & Cayuga Canal. The Seneca River issues from its northern end, and, with the Oswego River, carries the drainage to Lake Ontario.

Senecas (*sĕn'ê-kȧz*), an Indian tribe of the Iroquois family, formerly resident in western New York, where they became allied with Pontiac. They favored the English during the Revolution, but made peace with the Americans in 1784. In 1812 they joined the Americans. A small part became allied to the hostile tribes of the west, but peace was concluded with them in 1815. This band was removed to Indian Territory, now Oklahoma, in 1831, but about 2,750 Senecas are still on reservations in New York.

Senefelder (*zä'nẹ-fĕl-dẽr*), ALOYS, inventor of lithography, born in Prague, Nov. 6, 1771; died in Munich, Feb. 26, 1834. The son of an actor, he tried unsuccessfully to be both an actor and a dramatist. Acquiring a little knowledge of printing, however, he began to formulate ideas of his own for printing procedures and quite by accident in 1798 invented the process of lithography (*q.v.*). In the following years he made considerable improvements upon his discovery, procuring a patent and setting up a successful lithograph shop of his own. He was appointed inspector of the royal lithographing establishment in 1809.

Senegal (*sĕn-ê-gạl'*), a river of Western Africa, which rises on the northern slopes of the Kong Mts., near the sources of the Niger, and after a course of about 1,000 m. flows into the Atlantic near St. Louis. It receives an important tributary at Bafulabe, which is connected with Kayes by railway to overcome a number of falls, and from the latter town it is navigable to its mouth, a distance of nearly 700 m. In its lower course are many branches leading from the main channel, forming numerous fertile islands, but materially lessening its importance for navigation by larger vessels.

Senegal (*sĕn-ē-gôl′*), a country in Africa, more specifically in French West Africa. It is separated on the N. from Mauritania by the Senegal River and is bounded on the E. by the Sudanese Republic, on the S. by Portuguese Guinea and the Republic of Guinea, and on the W. by the Atlantic Ocean. Senegal includes the island and city of St.-Louis. The area is 76,104 sq. m. Senegal is mostly flat, with mountains in the east ranging to a height of 4,000 ft. The climate is hot. Negroes and Berbers form the population, with some Europeans located in the cities. Groundnuts and groundnut oil are the chief crop and exported product, respectively. There are some minerals. Dakar (*q.v.*), the capital (pop., *ca.* 250,000), is a major port. Formerly an overseas territory of France, Senegal, in 1958, was proclaimed the Republic of Senegal within the French Community. Population, 1957, 2,223,861.

Senegambia (*sĕn-ē-găm′bĭ-à*), the name formerly applied to a large part of French West Africa, but now used only to indicate the general area between the Senegal and Gambia Rivers, and sometimes extended as far south as the Gulf of Guinea on the West African hump.

Senn (*sĕn*), NICHOLAS, surgeon and traveler, born in Buchs, Switzerland, Oct. 31, 1844; died Jan. 2, 1908. He was brought to the U.S. by his parents in 1853 and for some time resided in Fond du Lac County, Wisconsin. In 1864 he was graduated from the Fond du Lac High School, taught in the public schools, and later studied medicine in Chicago. He later studied at the Univ. of Munich, Germany, and practiced his profession in Fond du Lac and Milwaukee. In 1893, he moved to Chicago, where he became professor of surgery in the Chicago Coll. of Physicians and Surgeons. Later he was professor of practical and clinical surgery at Rush Medical Coll. He traveled extensively in both hemispheres and made several notable trips to Arctic regions. His books include "Intestinal Surgery," "Surgical Bacteriology," "Tuberculosis of the Bones and Joints," and "In the Heart of the Arctics."

Senna (*sĕn′à*), the dried leaflets of several species of cassia, plants belonging to the bean family. These plants are native to Northern Africa, Western Asia, and Southern Europe, particularly to Arabia, Tripoli, and Egypt. Several allied species are native to the Eastern U.S., where they are known as wild senna, and the leaflets are used as a mild cathartic. Senna has long been employed in Western Asia as an important medicine. Its use was introduced to Europe by Arabian physicians in the 9th century. The dried leaves are now a staple drug. They yield medicinal properties useful in the treatment of numerous ailments, serving as a purgative and as a confection.

Sennacherib (*sĕn-ăk′ē-rĭb*), King of Assyria, son of Sargon, whom he succeeded on the throne in 705 B.C. He reigned until his death in 681 B.C. Among the notable events of his reign are the suppression of two revolts of Babylonia and successful wars against Ethiopia, Egypt, Armenia, Phoenicia, and Media. After a general invasion of Judah, he carried 200,000 Jews into captivity and required King Hezekiah to pay tribute money. Hezekiah's revolt against this oppression the following year was the cause of a second invasion of Judah. After marching through Palestine, he besieged Libnah, where an angel of the Lord is said to have slain 185,000 of his Assyrian warriors (an event celebrated in Byron's famous Biblical poem, "The Destruction of Sennacherib"), and he was compelled to make a hasty retreat to Nineveh. His reign of 22 years was eminently successful and witnessed the building of many palaces, monuments, canals, and highways. His improvements are mentioned with equal favor in the Scriptures, by Josephus, and by the Greek historian Herodotus. The most elaborate palace was that at Kuyunjik, which covered an area of eight acres and contained many rare sculptures.

Sensation (*sĕn-sā′shŭn*), a term in philosophy and psychology, denoting an impression of our senses through an outward subject or any kind of external stimulus which is conveyed to our consciousness. In this way impressions of light, color, form, sound, scent, touch, and smell modify our consciousness when we become aware of them by the specific faculties of our respective senses. Certain philosophical schools hold that sensations represent our first mental acts and that without sensations we would have no knowledge of reality (see *Locke, John; Hobbes, Thomas; Kant, Immanuel,* etc.). There are, however, other philosophical schools which believe that the awareness of sensations does not mean that reality corresponds to these sensations. Modern psychology has proved that our sensations are very often fallacious and modified by environmental influences, personal emotions, bodily violations, drugs, tendencies of our will, etc. While certain higher mental processes are possessed only by human beings, sensations are felt by all animals. Even the lowest animals, like the amoeba, react to differences of temperature or to touch; the higher in the animal kingdom, the more specific is the capacity of sensation; this go so far that birds and mammals react to differences in sound, color, and so on.

Sensationalism (*sĕn-sā′shŭn-ạl-ĭz′m*), the name for the philosophical schools which believe that all knowledge is ultimately derived from sensations, or remembered sensations or combined sensations. For the followers of these schools, under the leadership of Hobbes and Locke, consciousness means merely the reaction to the shocks to nerves which result from the impact of sensations. Berkeley and Hume (*qq.v.*) emphasize especially the importance of the association of sensations by similarity, causality, and coexistence.

Sensitive Plant (*sĕn′sĭ-tĭv plănt*), a herbaceous plant (*Mimosa pudica*), of the pulse family, with dense heads of small lavender flowers; it is native to Brazil. It runs wild in the Gulf states of the U.S., and is cultivated in greenhouses in the northern U.S., and outdoors anywhere during warm weather. Its leaf has many divisions, or leaflets, arranged along a middle stalk horizontally, like the barbs of a feather. In darkness these leaflets are raised so that they come together in pairs and are almost vertical, and the leaf stalk droops so that it is nearly parallel with the stem of the plant. Lightly touching a leaflet, or fanning or jarring the plant, will cause the same movements (hence the name sensitive plant); the leaves, however, resume their normal position and appearance after a few minutes. The wild sensitive plant is *Cassia nictitans,* also of the pulse family, with similarly sensitive leaves and small yellow flowers borne singly near the leaves.

Seoul (*sę-o͞ol′*), or KEIJO, capital of the Republic of Korea (South Korea), situated in a narrow valley on the Han River, about 24 m. from the Yellow Sea. The city was founded toward the end of the 12th century and became the capital of Korea late in the 16th century. Korea was closed to foreigners until Japan occupied the country during the Russo-Japanese War (1904-05), and it remained a colony of Japan from 1910 until the end of World War II. Following the war Seoul became the capital of the U.N.-sponsored Republic of Korea, established in 1948. In June 1950, when Communist forces from North Korea crossed the 38th parallel, Seoul became a strategic military target for both U.N. and Communist forces and changed hands several times during the subsequent war (see *Korea*). During this period many of the city's landmarks were destroyed by bombing and street fighting. Population, 1959, 1,642,599.

Separator (*sĕp′ȧ-rā-tẽr*). See *Creamery.*

Sephardim (*sĕ-fär′dĭm*), the descendants of those Spanish and Portuguese Jews who were forced to migrate during the Middle Ages. They are distinguished from the Ashkenazim, the general term for Jews of Eastern Europe, and are sometimes referred to as a Jewish nobility.

Sepia (*sē′pĭ-ȧ*), the name of a species of cuttlefish, which is characterized by an organ known as the ink bag. It is very abundant in the Mediterranean and the waters off the southern shore of Asia. The animal uses the black fluid in the ink bag to darken the water when attacked by an enemy, and it is thus enabled to retreat or escape in obscurity. It was formerly much used in the manufacture of India ink. Sepia is also a color, of brownish hue.

Sepoy (*sē′poi*), or SEPAHI, former name of Indian soldiers, used to distinguish them from the white soldiers employed by the British. Efforts to train natives of high caste for the army were first made in the 18th century by the East India Co., which allowed them to use the sword and target instead of the musket, and to wear turbans, vests, and long trousers in place of regular uniforms. It was found that these soldiers rendered good service in both the English and French armies, facing danger with courage and firmness. Their number was increased, until in 1857 the Sepoys in the British service numbered 240,000, while the total army in India was only 300,000. In that year the high-caste Hindus in the Bengal army incited the famous Sepoy Rebellion, or Mutiny, which cost the British government many lives and fully $200,000,000. During World War II some 2,725,000 Indians saw active service in the Indian army, which was dispatched to many theaters of the war.

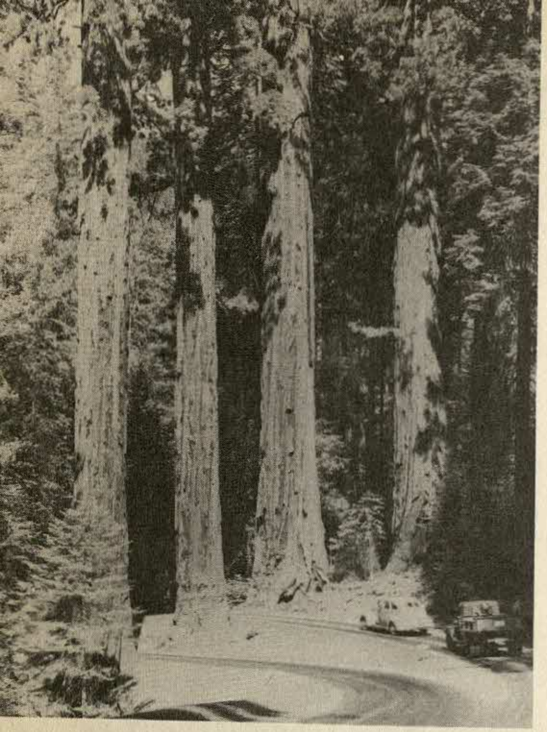
Sepsis (*sĕp′sĭs*), in medicine, the state of being poisoned by absorbing products of a putrefactive process.

September (*sĕp-tĕm′bẽr*), the ninth month of the Gregorian year. It was the seventh month in the Roman calendar, the year beginning in March, as did the legal year in England until 1752. The Anglo-Saxons called it Gerst-month, or barley month, since that cereal, their most important crop, ripened in September where these people dwelt.

Septicemia (*sęp-tĭ-sē′mĭ-ą*) or BLOOD POISONING, a morbid condition caused by the presence in the blood of pathogenic bacteria and their toxins.

Septimius Severus (*sĕp-tĭm′ĭ-ŭs sē-vē′rŭs*), ARCH OF, the name of a triumphal arch erected in Rome (A.D. 203) and dedicated to Lucius Septimius Severus (*q.v.*) and his two sons, Geta and Caracalla, to commemorate the victory over the Arabians and Parthians. Located on the Forum, the arch is 75 ft. high and has three passageways.

Septuagint (*sĕp′tū-ą-jĭnt*) or ALEXANDRIAN VERSION, the earliest translation of the Old Testament into the Greek language. It was ordered by Ptolemy (II) Philadelphus (309-246 B.C.)—because the Alexandrian Jews no longer understood Hebrew—and was begun in the 3rd century B.C. The name Septuagint (from the Latin word for 70) is derived from the tradition that the version was completed in 72 days by 72 scholars



Courtesy National Park Service

SEQUOIA TREES

brought from Jerusalem for the purpose. Although the quality and authenticity of the version vary widely because of the number of translators, the Septuagint is of highest importance in Bible research and criticism, for many parts of the Old Testament which were lost in pre-Christian times and in the Christian era are found only in this translation. The Greek Catholic Church still uses this version, indicated by the symbol LXX. See also *Bible*.

Sequestrum (*sē-kwĕs'trŭm*), in medicine, a dead bone or part of a bone detached from the living bone.

Sequoia (*sē-kwoi'à*), either of two kinds of evergreen trees native to California: the coast redwood (*Sequoia sempervirens*) growing along the coast ranges, and the Sierra redwood, or giant sequoia (*S. gigantea* or *Sequoiadendron giganteum*) growing on the western slope of the Sierra Nevada range. These trees of the pine family have very numerous tiny leaves, one-half to one inch long, relatively small seed-bearing cones, about 1 to 3 in. long, and red bark and wood. The bark is deeply grooved and fibrous; it grows from one to 2 ft. thick and is practically fireproof. The wood of the coast redwood is particularly valuable and long-lasting. It is used in building, for posts, railroad ties, etc., and for furniture. The wood of the giant sequoia is too brittle for such uses, but the bark of both is used for insulation against heat and sound, for filling mattresses, life preservers, and for mats. Sequoias are interesting chiefly because of their great size and age. The coast redwood is the tallest of all trees; one has been measured which was 364 ft. tall. Giant sequoias, from 250 to 300 ft. tall, are greater in volume or mass than any other trees; many of them are from 25 to 30 ft. in diameter. The age of some living giant sequoias has been estimated at 2,000 to 3,000 years; that of coast redwoods at 1,500 years. Most of the trees, which are unusually resistant to insects, fungi, and fire, are also protected in government-owned parks against unwise lumbering practices. See also *Sequoyah*, after whom the trees were named.

Sequoyah (*sē-kwoi'à*), Cherokee Indian leader, born in Tennessee, in 1770; died in Mexico, in 1843. The son of a Cherokee woman and supposedly of a German trader named Nicholas Gist, his English name was George Guess. Sequoyah was reared in Georgia and became a silversmith and trader. He invented a Cherokee alphabet in 1821 in which newspapers, the Bible, hymns, tracts, and many books were published. In 1828, he went to Washington as one of the representatives of the Western tribes, and later helped in the resettlement of the Cherokee in Oklahoma. A bronze statue of Sequoyah was the first contribution (1917) of the state of Oklahoma to Statuary Hall in the U.S. capitol in Washington, D.C.

Seraglio (*sē-răl'yō*), the old palace of the sultans at Constantinople (Istanbul), built by Mohammed II on the site of the old acropolis. It is situated on an eminence that overlooks the sea, and its enclosing wall has a length of fully 9 m., within which are beautiful gardens, mosques, official buildings, and the harem. By extension, the term has come to mean any oriental or, more specifically, Mohammedan harem.

Serao (*sä-rä'ō*), MATILDA, novelist, born at Patras, Greece, Oct. 26, 1856; died at Naples, Italy, July 25, 1927. Her father was a political exile from Italy and her mother was of noble blood. She was primarily a journalist and founded her own newspaper, the *Giorno*, in 1904. Her writings, distinctive for their careful details, deal with social questions, and include short stories, sketches, and novels. Her best-known novel was published in English as "The Land of Cockayne."

Seraphim (*sĕr'à-fĭm*), in the Old Testament, an order of angels with three pairs of wings (Isaiah 6:2 *ff*.). Seraphim are said to surround God and chant his praises, "Holy, holy, holy, is the Lord of hosts: the whole earth is full of his glory.' The Hebrew word *seraph* is found (in the singular) in Numbers 21:8; Isaiah 14:29 and 30:6, describing a fiery serpent; hence it was originally assumed that seraphim were serpent-like in appearance.

Serapis (*sē-rā'pĭs*), or SARAPIS, an ancient Egyptian god introduced in the time of Ptolemy

I. During the Ptolemaic Dynasty his cult was especially popular in Alexandria, spread widely to the Hellenistic world, and was even followed throughout the Roman empire.

The name Serapis allegedly is a combination of Osiris, one of the principal Egyptian gods, and Apis, name of the sacred bull of the ancient Egyptians. The combination of names signified that the new deity was endowed with the combined attributes of the older deities. A statue of Serapis was set up in a splendid temple at Alexandria, known as the Serapeum, to which was afterward joined the celebrated library of Alexandria. This temple was the last place of security held by the pagans when Christianity was introduced, and the worship of Serapis ceased only with the destruction of the image in A.D. 398, as ordered by Emperor Theodosius. During excavations at Memphis and other ancient cities numerous statues of Serapis were discovered.

Serbia (*sẽr′bĭ-ȧ*). See *Yugoslavia.*

Serf (*sẽrf*), a person whose service was attached to the estate on which he lived and with which he might be transferred. Serfdom had a wide foothold in Europe under the feudal system. The condition of serfs was not exactly that of slaves, but resembled it in many respects. Three principal classes of laborers were maintained in most European countries in the Middle Ages: the freemen, the villeins, and the serfs. Villeins occupied a middle position between the other two classes and could with comparative ease become freemen, but a serf could become free only by purchase or extended military service. Though serfs were not regarded as personal or chattel property like slaves, they could be transferred with the property to other owners. The serfs gradually decreased in number as the release from serfdom became easier with the spread of education; industrialization and advancing social consciousness also had a bearing on the matter. Serfdom existed in Scotland as late as the 18th century. The tenant practice in Ireland was little better than serfdom, and the sharecropping system in the American South and peonage in Mexico are vestigial survivals of that institution. Russia, the last European country maintaining serfdom, abolished it on March 17, 1861, under Czar Alexander II. See also *Slavery.*

Sergeant at Arms (*sär′jẹnt ăt ärmz*), an officer of legislative bodies who has the power to maintain order, and arrest offenders against the peace or security of those bodies.

Serigraph (*sẽr′ĭ-grăf*), from the Greek *seri,* silk, and *graph,* to write or draw, a handproofed illustration in the same classification as etchings, lithographs, wood-engravings, etc. Serigraphs (issued by the artist in restricted, signed editions) are printed with separate stencils for each color. The handmade stencil may be produced by several methods, and the stencil-making method allows much flexibility. Prints can be designed with flat areas of color or with parts broken in both color and texture.

A piece of finely woven silk, stretched on a rigid frame hinged to a board, is used in the making of a serigraph. In the tusche-resist method of making a stencil, the parts to be printed with a certain color are painted or drawn in with a greasy substance called tusche. The silk is then coated with glue and the tusche is removed with a solvent, thus carrying the glue away from the areas to be printed and leaving only the clear silk. Then the printing paint is poured into the well, formed by the frame, and forced through the clear parts of the silk onto the paper beneath by a heavy rubber squeegee. All sheets of an entire edition are printed before the screen is washed with water and the process is then repeated for each subsequent color.

Interest in serigraphs has increased considerably in recent years, and a collection of American serigraphs is always on exhibition at the National Serigraph Society in New York City.

Serinagar (*sẹ-rē-nŭg′ẽr*) or SRINAGAR, a city in India, the summer capital of the state of Jammu and Kashmir (see *Kashmir*), divided into two sections by the Jhelum River. It is 175 m. N.E. of Lahore and has an elevation of 5,250 ft. There are numerous canals, and transportation is chiefly by boat. The city, once noted for its fine hand-woven cashmere shawls, is now a center of carpet making. Serinagar, with its fine scenery and many points of interest, is one of the finest summer resorts of Asia. Within the city are many mosques and palaces and an archaeological institute, and nearby are Buddhist ruins. East of the city is Dal Lake, with its famous floating gardens, celebrated in "Lalla Rookh" by Thomas Moore. Population, 1951, 207,787.

Serkin (*sẽr′ḳin*), RUDOLF, pianist, born in Eger, Bohemia, March 28, 1903. He studied in Vienna with Arnold Schönberg. He made his debut with the Vienna Symphony Orchestra at the age of 12 and began his concert career in Berlin, Germany, in 1920. He toured Europe with the violinist Adolph Busch, whose daughter he later married. Serkin made his American debut in 1933 at the Coolidge Festival of that year and played as a soloist with the New York Philharmonic, under Arturo Toscanini, in 1934. In 1939 he was appointed head of the piano department of the Curtis Inst. of Music. Considered to be a sensitive, intelligent interpreter and an accomplished technician, he has continued to make concert tours in America and England. He is the composer of a string quartet.

Sermon on the Mount (*sẽr′mŭn, mount*), in the New Testament, the sermon Jesus delivered to His disciples (Matthew 5:3-11; Luke

6:21-22). The sermon in all its beauty is probably a condensation of what Jesus taught on various occasions. The basic importance of this sermon is that in it the attitude of Jesus toward the Jewish law is defined. It contains the Beatitudes (*q.v.*). Essentially, this sermon opens the Messianic activities of Jesus. He gives here a kind of divine Magna Carta, formulating the main principles of Christianity, and connects them with an evaluation of the Jewish law. "Think not that I am come to destroy the law, or the prophets: I am not come to destroy, but to fulfill," He says (Matthew 5:7). The meaning of this and many other verses of the Sermon on the Mount have been subjects for much theological consideration, some of it emphasizing the character of Jesus as the fulfillment of the Jewish Messianic prophecy, some stressing more the independence of His ethical commandments.

Serous Fluid (*sē′rŭs flū′ĭd*). See *Serous Membrane.*

Serous Membrane (*sē′rŭs mĕm′brān*), a delicate tissue in the human body, composed of flattened endothelial cells, normally moistened on the interior side by a serous fluid. It forms a covering or sac around many organs and a lining for the closed cavities of the body. The chief serous membranes are the two pleurae, inclosing the lungs; the pericardium, surrounding the heart; the peritoneum, lining the abdominal cavity; the arachnoid, forming the middle of the three membranes enveloping the brain and spinal cord, and the lining of the moveable joint cavities. All of the serous membranes secrete, and absorb continuously, a certain amount of clear thin *serous fluid,* similar to blood serum or lymph, which lubricates the lining of the cavity and the surfaces of the contained organs to allow their free movement. Disease, such as inflammation or tumors involving serous membranes, may cause a greater effusion flow than the possible absorption of serous fluid, thus filling and enlarging the cavity. These diseases when cured often cause thickening (fibrosis) of the serous membrane and adhesions.

Serpent (*sẽr′pẹnt*), a name loosely used for snakes (*q.v.*) of the larger or more dangerous kinds. Because of its shape, a now obsolete bass wind instrument was called a serpent. It was derived, *ca.* 1600, from an older wooden instrument, and in turn was the direct ancestor of the modern bass horn. In the Bible, the name refers to the creature which tempted Eve (Genesis 3:1). Also, a *brazen serpent,* or serpent of brass, was made by Moses (Numbers 21:8), at the command of God, for the miraculous cure of persons bitten by serpents.

Serpentine (*sẽr′pẹn-tēn*), a mineral composed of magnesium, iron, and silica, widely distributed in all parts of the world. Serpentine occurs in all geological ages and forms large beds of primitive rock. The presence of iron and other impurities gives it a great variation in color, which ranges through different shades of purple, red, green, yellow, brown, and gray; the rock is sometimes marbled and mottled. It takes a high polish, and is used in making ornamental articles, such as vases, boxes, and pillars. Serpentine may be divided into two general varieties, known as common and precious serpentine. The common class occurs as a rock. It is usually soft, is easily broken, and has serpentlike veins. Precious serpentine is the harder and more beautifully colored, but is of quite rare occurrence. Fine deposits of serpentine rock occur in Bavaria, the Shetland Islands, Corsica, Canada, and the U.S.

Serra (*sĕr′rä*), JUNIPERO, missionary, born MIGUEL JOSÉ SERRA on the island of Majorca, Nov. 24, 1713; died in Monterey, Calif., Aug. 28, 1784. Serra joined the Franciscan brotherhood in 1730, and was sent as a missionary to Mexico City in 1749. He worked among the Indians northeast of Querétaro (1750-59) and was later sent to Lower California (1767). He established a number of Franciscan missions in Upper California, beginning with one at San Diego (1769), which was the first European settlement in that territory. The famous and beautiful missions at San Carlos de Monterey (1770), San Luis Obispo (1772), San Juan Capistrano (1776), Santa Clara (1777), and elsewhere were important stages in the conquest of California by Europeans.

Sertorius (*sẽr-tō′rĭ-ŭs*), QUINTUS, Roman general, born at Nursia, Italy, about the end of the 2nd century B.C.; died in Asia Minor in 72 B.C. He served under Marius (*q.v.*) against the Teutons and in Spain, but later quarreled with Marius and went to Spain and North Africa, where he organized armies against Sulla (*q.v.*). Sertorius had no love for fighting his native country, however, and accepted an offer from Mithridates (*q.v.*) to aid him in recovering the provinces of Bithynia and Cappadocia. While still engaged in this task, he was assassinated by Perperna, another general, who had joined him two years before but had now turned against him.

Serum (*sē′rŭm*), the watery part of an animal or vegetable fluid, especially referring to the clear liquid, called blood serum, which remains when blood clots in a glass jar or other suitable container. This substance contains all the factors not used up in clotting as well as many others. Antibodies, which protect an individual against disease (see *Antibody; Serum Therapy*), and proteins, which act as carriers for vital materials (*e.g.,* iron and calcium), are examples of its constituents. Serum tests furnish the physician with valuable evidence in the diagnosis of a patient's illness.

Serum Therapy (*sē′rŭm thĕr′ȧ-pȳ*) or

MICHAEL SERVETUS

SEROTHERAPY, the treatment of infectious and contagious diseases of man by means of human or animal blood serum, containing *antitoxins* (counterpoisons or antidote substances elaborated by the body to counteract the *toxins*—poisonous substances—produced by invading bacteria or viruses). In addition, serum therapy is concerned with preventing the contraction of a disease by a patient exposed as well as furnishing immunity against acquiring it. The blood of a person suffering with an infectious disease is charged more or less with bacteria, and up to a certain stage their development in the patient increases.

Considerable progress has been made in developing serum therapy since the middle of the 19th century, *e.g.*, in the treatment of diphtheria. The therapy is also used in cases of scarlet fever and various other streptococcal infections, staphylococcal infections, meningitis, pneumonia, typhoid, tetanus (lockjaw), and influenza, and also for measles and certain other virus diseases.

The advent of the sulfa (*q.v.*) drugs and penicillin (*q.v.*) has greatly reduced the amount of serum therapy practiced except in special cases of certain strains of bacteria which prove to be resistant to the above-named antibacterial drugs. Standard antitoxin serum preparations are used in general immunization procedures in combating threatened epidemics, or in individual cases where an already present debilitating condition precludes sustaining another disease. Serum therapy is also now used in treating and developing resistance against allergic conditions such as hay fever, ragweed fever, and sensitivity to other pollens, and also against systemic poisoning from snake bite (*e.g.*, antirattlesnake venom serum), spider bite, and certain other poisonous insects.

Serval (*sẽr′vạl*), a South-African wild cat (*Felis capensis*), somewhat resembling the lynx (*q.v.*) but without tufts on its ears. The legs of a serval are long, its color tawny with black spots, rings, and two longitudinal stripes, and its tail is ringed. It can be domesticated if taken when young. In the fur trade, the pelt is known as "tiger cat."

Servetus (*sẽr-vē′tŭs*), MICHAEL, physician and theologian, born at Tudela, Navarre, Spain, in 1511; died in Geneva, Switzerland, Oct. 27, 1553. The son of a notary, he studied law in the Univ. of Toulouse, France, but later turned to theology. During travels in Germany and Switzerland, he became acquainted with the leading reformers and their doctrines, some of which he adopted. In 1533, he studied medicine at Lyons under the assumed name of Michel de Villeneuve. Later, in Paris, he met John Calvin (*q.v.*). In 1553, he published "The Restoration of Christianity," in which he advanced doctrines which were opposed by both the Reformers and the Catholics. Although Servetus denied the Trinity, he was devoted to Christ, whom he considered the center of his thinking and of the universe.

Arrested in Geneva, Switzerland, Servetus was put to trial on charges of blasphemy, materialism, heresy, and pantheism. The decision was to the effect that Servetus should pay a fine and be burned at the stake by a slow fire, unless he declared his retraction. This he declined to do and both he and his books were burned. As an anatomist he was ahead of his times, in that he anticipated the discovery of the circulation of the blood by William Harvey (*q.v.*). The name Servetists was later given to a small party in Switzerland that rejected the doctrine of the Trinity.

Servia (*sẽr′vĭ-ȧ*). See *Yugoslavia*.

Service (*sẽr′vĭs*), ROBERT WILLIAM, author, born in Preston, England, Jan. 16, 1874; died in Lancieux, France, Sept. 11, 1958. Educated in Scotland, he later spent several years in the Yukon Territory. He drove an ambulance in World War I and used his experiences as the basis of "Rhymes of a Red Cross Man" (1916). Although his writings include novels and other works, he is best known for his poems about the outdoors and the "he-man" life, written in easy rhythms frankly modeled after the similar poems of Rudyard Kipling (*q.v.*). His best-known books are "Songs of a Sourdough" (1907), which included the popular ballad, "The Shooting of Dan McGrew"; "Songs of a Sun-Lover" (1949); and "Rhyme and Romance" (1958). He wrote an autobiography, "Ploughman of the Moon" (1945).

Service Clubs (*sẽr′vĭs klŭbz*), a name used to designate associations maintained by business and professional men to promote acquaintance, to stimulate interest in each other, and to cooperate for the welfare of the community. The first of such clubs to be organized was the Rotary International (*q.v.*). There are many such organizations—*e.g.*, Kiwanis and Lions International (*qq.v.*)—with a wide variety of names. The designation is also applied to clublike recreation centers set up for personnel of the U.S. armed forces by the United Service Organizations (U.S.O.), a cooperative group composed of various religious and welfare groups.

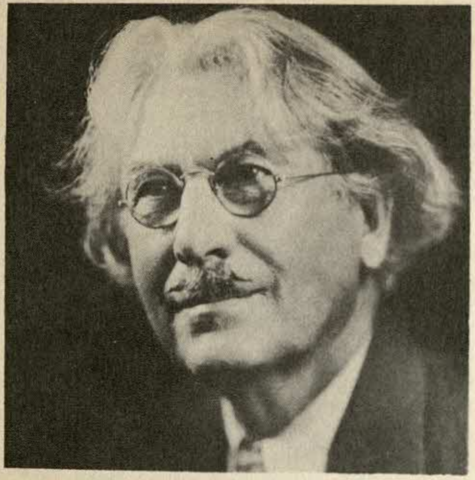


Photo by Jane Hardcastle

ERNEST THOMPSON SETON

Service Music (*sĕr′vĭs mū′zĭk*), an Anglican Church term, commonly applied to the elaborate musical settings of the canticles and other selected portions from the Book of Common Prayer, sung by the choir. Especially famous is the "Great Service" by the Elizabethan English composer, William Byrd (1542?-1623). Service music in a broader sense has been composed, corresponding to the respective liturgies, for the Eastern Orthodox, the Jewish, the Lutheran, and the Roman Catholic denominations.

Servius Tullius (*sĕr′vĭ-ŭs tŭl′lĭ-ŭs*), the sixth king of ancient Rome, who probably reigned from 578 to 534 B.C. His life is veiled in myth. He is generally supposed to have been the son of a slave, brought up in the home of Tarquin, whose daughter he is said to have married. He succeeded Tarquin as king of Rome, and is said to have adopted a constitution which made landed property the basis of the military system. In this way he admitted the plebeians (*q.v.*) to a place in the army and the government, a step which was opposed by the patricians. In the latter part of his reign he concluded an alliance with the Latins, and enlarged Rome by incorporating the Esquiline, Quirinal, and Viminal hills into the city.

Sesame (*sĕs′ȧ-mē*), a plant known botanically as *Sesamium orientale,* in the sesame family. It is a branching, downy annual plant which grows *ca.* 2 ft. tall, with tubular white or pink flowers *ca.* one inch long, borne singly next to the leaves, which may be from 3 to 5 in. long. Cultivated in India and tropical Africa since ancient times, it is now grown in the U.S., for the seeds and as a medicinal herb. By cold pressure the seeds yield an oil variously known as sesame, beni, gingili, teel, or til oil. This oil is used for cooking, for cosmetic preparations, for fine machine oil, and for making soap and perfumes. Lampblack derived from burning the oil is one of the ingredients of India ink. The seeds are sometimes used for food, in porridge and in confectionery; they are also parched and put into broth or pudding.

Sesostris (*sē-sŏs′trĭs*), the name given by the Greeks to a legendary king of Egypt. Early Greek writers assert that he divided Egypt into 36 districts and placed his brother as regent over them, and that he personally conducted a vast army into Libya, Arabia, India, Asia Minor, and finally Europe. They assert that he subdued Ethiopia, placed a large fleet on the Red Sea, and made subject the islands south of Asia. Many magnificent temples and obelisks or columns were erected during his reign, the latter depicting scenes of his conquests. Some writers identify the exploits assigned to Sesostris as those accomplished by Rameses II, while others regard the name as personifying several consecutive monarchs of Egypt.

Seti I (*sā′tē*), King of Egypt, ruler of the 19th Dynasty, son of Rameses I, born in 1313 B.C.; died in 1292 B.C. Many great buildings were erected in Thebes and other cities of Egypt during his reign. Inscriptions discovered at Karnak and elsewhere in Egypt give information on his campaign against Syria and Palestine through which he restored Egyptian control over these countries. He was succeeded by Rameses II. Seti II, the grandson of Rameses II, was the last ruler of the 19th Dynasty.

Seton (*sē′tŭn*), ERNEST THOMPSON, author and lecturer, born in Shields, England, Aug. 14, 1860; died at Seton Village, N.M., Oct. 23, 1946. He was brought to Canada at an early age, and in 1870 was sent to Toronto to attend public schools and the Collegiate Inst. He studied in England (1879-81) and then went to Manitoba, but spent much of his time traveling in Texas and New Mexico. He was made official naturalist to the government of Manitoba in 1891, in which position he rendered valuable service through his extensive knowledge of wild animal life, acquired by actual experience in the woods and on the plains. He was one of the pioneers in the Boy Scout movement, whose chief scout he was until 1915, when he began to devote most of his time to the Woodcraft League. He wrote many books on ornithology, wild and game animals, and woodcraft, one of the best of the latter being a boy's book, "Two Little Savages."

Setter (*sĕt′ẽr*), a breed of dogs originally trained to indicate the presence of game birds by crouching close to the ground, but now usually taught to stand rigid like a pointer. The Scotch, or Gordon, setter is a rich black, with tan on the legs, face and chest. Irish setters are sometimes kept as decorative dogs because of their silky, copper-colored hair. See also *Dog,* and color plate *Types of Dogs II* in Volume IV.

Settlement (*sĕt''l-mẹnt*), ACT OF, passed in Great Britain in 1701, limiting the powers of the crown, and providing that the crown descend to the House of Hanover and its heirs, thus excluding Roman Catholics from the throne.

Seurat (*sû-rä'*), GEORGES, painter, born in Paris, France, Dec. 2, 1859; died there March 29, 1891. Educated in the French academic tradition and studying with a pupil of Ingres (*q.v.*), he soon became interested in and influenced by the Impressionists. However, he went beyond the mere dissolving of colors as did the Impressionists, and composed his canvases out of fragments of unbroken pure color dots like a mosaic, assuming that these color particles would fuse in the eyes of the beholder. This technique he called Pointillism (from *point,* French, meaning dot, point). The school he founded together with Paul Signac (1863-1915) is also called Neo-Impressionism. Among the best known works of Seurat are "The Baignade" and "Sunday at the Grande Jatte," now in the Chicago Museum.

Sevan (*sĕ-vän'*), a lake in the east central part of the Armenian S.S.R., near the city of Erivan. It is situated almost due west of Baku and is surrounded by high mountains. The surface of the lake is *ca.* 6,300 ft. above sea level; the area is 540 sq. m. The Zanga River carries the overflow to the Aras River, which flows into the Caspian Sea. A former Armenian monastery is located on the island of Sevan (or Sevang), in the northwestern part of the lake.

Sevastopol (*sĕ-vȧs'tŏ-pŏl*). See *Sebastopol.*

Seven Against Thebes (*sĕv''n ạ-gĕnst thēbz*), seven legendary Greek heroes, dramatized by Aeschylus and Euripides. The seven—Adrastus, Amphiaraus, Hippomedon, Capaneus, Tydeus, Parthenopaeus, Polynices—went to war against Eteocles, King of Thebes, because Eteocles had deprived his brother Polynices of the latter's heritage on the death of their father, Oedipus. The only survivor of the heroes was Adrastus; the brothers killed themselves in battle. Ten years later, the sons of the seven heroes, the *Epigoni* (Greek, meaning offspring), attacked Thebes successfully under Adrastus' leadership to avenge their fathers.

Seven Deacons (*sĕv''n dē'kụnz*), THE, persons appointed by the Apostles (Acts 6:1-6) to perform the religious duty of serving the sick and the poor among the members of the church. The function of the deacon (*q.v.*) was thus early defined, and the word, which means a server, thus came into ecclesiastical use.

Seven Pines (*sĕv''n pīnz*). See *Fair Oaks.*

Seven Sisters (*sĕv''n sĭs'tẽrz*). See *Pleiades.*

Seven Sleepers (*sĕv''n slēp'ẽrz*), in legend, seven Christian youths of Ephesus, who around A.D. 250 escaped the persecution of the Roman emperor Decius by finding safety in a cave. When they were found, their persecutor ordered the entrance to the cave closed with great rocks, so that the Christian youths would die of starvation. Instead of succumbing to the torture, they fell into a deep sleep, and were entirely forgotten. They were awakened by shepherds, who were seeking shelter for their cattle, in A.D. 447. When one of them was sent to buy bread and food, he was astonished to see the cross raised in many places. On offering to pay with a coin of Decius instead of Theodosius II, the emperor then in power, he was placed under arrest, but was released on showing the cave where he and his six companions had slept for 196 years. Theodosius visited the spot in order to confirm the report, and was impressed with the truth of the resurrection of the body. The Seven Sleepers relapsed into a deep sleep immediately after talking to Theodosius. July 27 has been consecrated to their memory by the Roman Catholic Church. The story is also related in the Koran.

Seventh-day Adventists (*sĕv'ẹnth-dā ăd'-vĕnt-ĭsts*). See *Adventists.*

Seven Weeks' War (*sĕv''n wēḳs wạr*), the name given to the War of 1866 between Prussia and Austria. It was caused by unsettled conditions in Schleswig-Holstein. Bismarck, planning to consolidate the German states under the leadership of Prussia, concluded an alliance with Italy. When Austria allegedly violated the Treaty of Gastein, by which the Schleswig-Holstein question was settled, Prussia, joined by Italy and most of the North-German states, declared war. Bavaria, Hanover, Hesse, Saxony, and Württemberg supported Austria. Three armies promptly invaded Austrian territory and defeated an army of Saxons and Austrians in the Battle of Sadowa, in Bohemia, after which they marched upon Vienna. Archduke Albert, who commanded the Austrian forces in Italy, was compelled to withdraw from Verona to aid in defending the capital. However, the Austrian fleet under Adm. Tegetthoff defeated an Italian fleet under Persano. In the meantime the army of Hanover and the South-German states was compelled to surrender, and Austria had no recourse but to sue for peace. The war was ended by the Treaty of Prague, which incorporated Frankfort, Hanover, Hesse-Nassau, and Schleswig-Holstein into Prussia. By its terms Austria ceased to be a member of the North-German Confederation and Prussia's power within the league was enhanced considerably.

Seven Wise Men (*sĕv''n wīz mĕn*), or SEVEN SAGES OF GREECE, the designation applied to a number of Greek sages, who were devoted to the cultivation of practical wisdom. They lived about 620-548 B.C. Writers attribute to them a number of maxims on prudence and morality, but there is no uniformity among the ancients either as to the names or the sayings of these sages. The list of names and characteristic sayings is usually given as follows:

Bias of Priene in Caria—"Too many workers spoil the work."
Chilon of Sparta—"Know thyself."
Cleobulus of Rhodes—"Moderation is the chief good."
Periander of Corinth—"Forethought in all things."
Pittacus of Mitylene—"Know thine own opportunity."
Solon of Athens—"Nothing in excess."
Thales of Miletus—"Suretyship brings ruin."

Seven Wonders of the World (*sĕv''n wŭn'dẽrz of the wûrld*), a name applied by ancients to seven works of art of remarkable splendor and magnitude. The term originated in Greece after the time of Alexander the Great. Of all the Seven Wonders, only the *Pyramids* (*q.v.*) remain to testify to their ancient magnificence. The Great Pyramid of Cheops (*q.v.*) contains nearly 7,000,000 tons of stone, built block by block by 100,000 slaves over a 20-year period. The *Hanging Gardens* (*q.v.*) *of Babylon,* reared by Nebuchadnezzar for his queen, consisted of a series of exquisite terraces built on top of each other. When the widow of King Mausolus of Caria erected a tomb for her husband, she created a marvel which inspired the present-day name for ornate graves, *mausoleum* (*q.v.*). A fourth wonder, the *Temple of Diana* at Ephesus, survives only in history's references to its magnificent pillared front and celebrated statue of Diana (see *Diana, Temple of*). Two of antiquity's marvelous structures were statues. The celebrated *Colossus* (*q.v.*) *of Rhodes* (*q.v.*) was a huge bronze image of Apollo which once stood at the entrance to Rhodes' harbor, looking out on the Aegean Sea. The *Statue of Jupiter,* at one time in the temple at Olympia (*q.v.*), was the masterpiece of the sculptor Phidias (*q.v.*). A lighthouse is also included among the world's wonders, the *Pharos* (*q.v.*) *of Alexandria* (*q.v.*), built by Ptolemy I in the 3rd century B.C. See also color plates in this volume.

Seven Years' War (*sĕv''n yērz wạr*), a contest for the possession of Silesia and the domination of the German states by Austria or Prussia. It was waged by Empress Maria Theresa of Austria against Frederick the Great of Prussia (1756-63). Silesia had previously belonged to the Austrian dominions, but was annexed to Prussia at the time of the war for succession to the throne of Austria. In 1756 the empress formed an alliance with France, Spain, Russia and several smaller powers to wage war on Prussia; Frederick was supported by England. Decisive battles were fought at Prague, Leuthen, Liegnitz, and Torgau which were won by Prussia, and Kolin, Hochkirch, and Kunendorf which were won by the allies. The war continued with varying success, Frederick holding out stubbornly against much larger enemy forces, until the death of Empress Elizabeth of Russia, in 1762, when Peter III ascended the throne. This sovereign, a great admirer of Frederick, immediately signed a treaty of peace and sent an army of 15,000 men to his assistance, thus turning the tide in favor of Prussia. War was terminated by the Treaty of Hubertusburg on Feb. 15, 1763, which confirmed the title of the Prussian throne to Silesia. A part of this extended war was carried to America by the French and English, this latter phase being known in American history as the French and Indian Wars (*q.v.*).

Severn (*sĕv'ẽrn*), a river of western England, the second largest of that country, exceeded only by the Thames. It rises in the mountains of Wales, and, after flowing northeast to Shrewsbury, it assumes a circuitous course toward the southwest and flows by a wide mouth into Bristol Channel. The total length is 210 m., of which 180 m. are navigable, and its basin has an area of 8,575 sq. m. It forms an estuary which becomes the Bristol Channel. A railway tunnel of about 4 m. passes under the estuary. It receives the water from the Tern, Teme, and Avon Rivers. The valley is fertile, and contains manufacturing cities.

Seversky (*sĕv-ẽr'skĭ*), ALEXANDER P. DE, aviation authority, born in Tiflis, Russia, June 7, 1894. He was graduated from the Imperial Naval Acad. of Russia. During World War I he was assigned to a bombing squadron. Shot down during a mission, Seversky lost his right leg, but returned to duty and was credited with 13 enemy planes destroyed. He settled in America in 1918, became a test pilot and engineer for the U.S. government in the same year and a consulting engineer to the U.S. Air Forces in 1921. The year following he formed the Seversky Aero Corp., which became the Seversky Aircraft Corp. in 1931. He is the inventor of many aeronautical improvements such as the first fully automatic bombsight, and the first air-cooled engine for fighter planes with a turbo-supercharger for high-altitude flight. He wrote "Victory Through Air Power" (1942) and "Air Power: Key to Survival" (1950). See also *Aviation*.

Severus (*sē-vēr'ŭs*), ALEXANDER, Roman emperor, born at Arca, in 205; slain in A.D. 235. Of Syrian parentage, he was adopted by Emperor Heliogabalus and received his education in Rome. At the death of the emperor, in 222, he was proclaimed sovereign. Still very young, he was strongly dominated by his mother, Julia Mammaea. The latter's administration and political course were not favored by the army, and military groups seized power during the war against the Persians (232-235). Although further Persian advances were checked, the war did not otherwise prove of material advantage to the Romans. Severus took personal command of the Roman army during the Germanic invasion in 235. He was slain in a mutiny by his own men, and Maximinus was chosen as his successor.

Severus, LUCIUS SEPTIMIUS, Roman emperor, born in the African town of Leptis Magna, Apr. 11, 146; died in York, England, Feb. 4, A.D. 211. His family was of the equestrian rank and educated him well. He afterward moved to Rome, where he was made praetor in 178. After commanding an army in Gaul, he became governor of Gallia, Pannonia, and other provinces, and in 193 was proclaimed emperor as successor to Pertinax. Didius Julianus had been placed on the imperial throne by the praetorians before Severus reached Rome, but he successively defeated him and other rivals, banished the praetorians, and won the support of Albinus, commander of the Roman forces in Britain, by conferring upon him the title of Caesar. Shortly after, he made an extended campaign in the East, which was followed by the capture of Byzantium after a three years' siege.

Clodius Albinus became ambitious to occupy the throne of Rome and organized 150,000 men to fight against Severus, who defeated him at Lyons in 197. Severus then returned to Rome, where he distributed much valuable property secured on his extensive campaigns, but subsequently made a second expedition to the East to repel an invasion of the Parthians and suppress insurrections in Seleucia and Babylonia. He crossed into Egypt from Parthia, where he captured Alexandria, and soon returned to Rome with great wealth, which he lavished upon his soldiers and subjects. A rebellion in Britain required him to lead an army across the English Channel in 208, and while on the island he marched into Caledonia (*q.v.*).

Sevier (*sė-vēr′*), JOHN, soldier, born in Rockingham County, Va., in 1745; died in Alabama, Sept. 24, 1815. He was descended from French parents and at the age of 16 became a pioneer on the Holston River, in what is now Tennessee. Here he built Ft. Watauga and fought against the Indians. During the Revolutionary War he sided with the Americans, taking part in the Battle of King's Mountain and other engagements. In 1785, he was chosen governor of the State of Franklin, which comprised parts of North Carolina and Tennessee. When this state was broken up and made a part of North Carolina, he was elected to Congress in 1790. He was elected governor of Tennessee in 1796 and was several times re-elected. He also served in Congress (1811-15).

Sévigné (*sā-vēn-yā′*), MARIE DE RABUTIN-CHANTAL, MARQUISE DE, letter writer, born in Paris, France, Feb. 5, 1626; died at Grignan, Apr. 17, 1696. She lost her parents early in life and lived with her maternal uncle, Christophe de Coulanges, abbé of Livry, who provided amply for her education, giving her well-directed training in French, German, Italian, Spanish, and Latin. In 1644 she was married to the Marquis de Sévigné, a Breton of good family but small estate, who was killed in a duel in 1651. She never married again—but instead followed closely the affairs of court and society, and devoted herself to the education of her son and daughter. The daughter, Françoise Marguerite, became Madame de Grignan in 1669, and accompanied her husband, Comte de Grignan, to his estate in Provence. Thus the opportunity for writing many letters was provided Madame de Sévigné. These letters cover the principal events of European history for about 25 years, and in addition are full of information about the life and customs of the time, valuable alike from the standpoint of history and for the charming style in which they were written. Although they sparkle with affection, wit, frankness, and careful scrutiny of human character, a complete edition was not published until 1862-68.

Courtesy Spanish State Tourist Dept.

VIEW OF SEVILLE

Seville (*sĕv′ĭl* or *sė-vĭl′*), or SEVILLA, a city in Spain, on the Guadalquivir River, capital of the province of Seville (area, 5,428 sq. m.; pop., *ca.* 1,000,000). The city is located about 60 m. N.E. of Cadiz and occupies an imposing site on the east bank of the river, which is crossed by a number of bridges. The inner city was surrounded by a circular wall in Moorish style; many of its gates remain. It is an important railroad junction and port of entry, having a large interor and foreign trade and a spacious harbor. The chief manufactures are leather, cotton textiles, silk and woolen goods, pottery, tobacco products, machinery, hardware, soap, and utensils.

The city is rich in architectural monuments, from Moorish times through the 18th century, the most important being the late-Gothic cathedral, begun in 1402 on the site of a 12th-century mosque; numerous churches from Gothic

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through baroque times; the Alcázar, the palace of the Moorish kings and later of the Spanish rulers, founded in 1181; the town hall and numerous palaces with beautiful patios and typically Spanish iron gates. Besides the public schools, it has a large number of convents, a university, founded in 1256, and numerous parks and gardens. The chief landmark, visible from far away, is the Giralda tower, a 12th-century minaret, to which other architectural elements were added in the 16th century; together with an old courtyard, it is now incorporated into the cathedral complex. The cathedral contains the tombs of Columbus and his son, and of Ferdinand III of Castile, and a large number of excellent sculptures and wood carvings.

Seville is an ancient city, called Hispalis by the Romans. In the later part of the Roman period it rose to great importance, and during Vandal and Goth occupation it was the capital of southern Spain. It fell into Moorish possession in the 8th century, when it rose to a city of 400,000 people, and was made the capital of the Moorish kingdom in 1026. Ferdinand III of Castile conquered it in 1248, and it remained the capital of Spain until the reign of Charles V, when it was superseded by Valladolid. The discovery of America gave Seville an immense trade with the colonies. At that time it rose to the height of its prosperity, and it was Spain's cultural center through the 16th and 17th centuries. It lost much of its importance when Cadiz surpassed it as trade center in the early 18th century. The French captured the city in 1810. Seville was seized early in the Spanish Civil War (1936-39) by troops of Gen. Franco, who reportedly instituted a "purge" among its citizens during which allegedly 9,000 persons were killed. Population, 1949, 382,564.

Sèvres (*sâ'vr'*), a city in France, on the left bank of the Seine River, 7 m. s.w. of Paris. It is famous for the manufacture of porcelain, being the seat of the large factory which was transferred to the city from Vincennes in 1756. Some of the porcelain products of Sèvres are classed among the most valuable in the world. The French Bureau of Standards is located in Sèvres. The town was captured by the German army in 1870, and its beautiful porcelain museum was partially destroyed. In 1920, the treaty ending the state of war between the Allies and Turkey was signed here. Sèvres was occupied by the Germans early in World War II, and was liberated by the Allies in 1944. Population, *ca.* 15,500. See also *Chinaware*.

Sewage (*sū'ĭj*). See *Sewerage*.

Seward (*sū'ẽrd*), WILLIAM HENRY, statesman, born in Florida, N.Y., May 16, 1801; died in Auburn, N.Y., Oct. 10, 1872. After being graduated from Union Coll., he studied law and established a practice in Auburn. He was elected to the state senate (1830) but was defeated in 1833. Nominated unanimously as the Whig candidate for governor (1834), he was defeated, but was later twice elected on the same ticket (1838, 1840). As governor, he early favored the antislavery movement, and secured the establishment of a free, nonsectarian public school system in New York City. As a member of the U.S. Senate (elected 1848), he opposed proposals to allow territories to decide on their own free or slave status, and argued successfully for the admission of California and Kansas as free states.

President Lincoln (*q.v.*) appointed Seward his Secretary of State (December 1861), in which position he remained until 1869. Before war actually came, he rashly argued that a foreign war would unite the discordant states, but once war was begun, his thinking became calm and statesmanlike. A diplomatic peak was reached in the Trent affair (*q.v.*), when Seward's wisdom averted the possibility of British intervention in the Civil War. Seward also avoided difficulties with France when Emperor Maximilian (*q.v.*) was executed in Mexico. One of Seward's greatest achievements was the purchase of Alaska from Russia (1867). A confirmed expansionist, he advocated the acquisition of certain of the Danish West Indies and of the Dominican Republic, and the annexation of Hawaii. On the night of April 14, 1865, when Lincoln was assassinated, one of the conspirators entered a bedroom where Seward was recovering from serious injuries received in a carriage accident and stabbed him, but the wound was not serious. After retiring from office he traveled around the world and wrote several books, including an autobiography and an account of his travels. Despite the fact that his career began in simple politics, Seward earned himself, by his conduct of foreign affairs through a highly critical period, a niche as one of the nation's great statesmen.

Sewellel (*sê-wĕl′lĕl*), a medium-sized North-American rodent (*Aplodontia rufa*), found in British Columbia and as far south as California. They are reddish-brown, stocky animals somewhat resembling muskrats or beavers; however, in contrast to the latter, sewellels have almost no tails. Their skulls are thick and flat, and their ears and eyes small. They are semi-aquatic and live along streams or ponds, often in loosely organized colonies. They feed on leaves and stems. The Indians used their skins for clothing and their popular name is derived from a Chinook word.

Sewerage (*sū′ĕr-ĭj*), the system of collecting, transporting, pumping, treating, and final disposition of the liquid wastes of premises or a community, known as *sewage*.

Since sewage is subject to rapid decomposition with accompanying foul odors, and contains organisms capable of causing disease, an adequate sewerage system is of the highest importance to the health, comfort, and convenience of a community, as has now long been recognized.

The system of collecting sewers in the city streets may be constructed on either the combined or separate systems. In the former, both organic wastes and surface drainage are carried in one system of pipes and conduits, while in the latter, sewage proper containing the objectionable organic wastes is carried in a separate system of smaller piping. The separate system permits rain water and surface drainage to be diverted less expensively to the nearest waterways and avoids the necessity of providing for excessive volumes to be handled in trunk sewers and in treatment works. The older cities developed combined sewerage systems before there was an appreciation of the ill effects of sewage pollution upon the receiving waters, and since it is not economically feasible to convert to the separate system, extensions are usually on the combined basis with perhaps some local modification. New sewerage installations, however, are generally on the separate system, for the reasons stated. Where combined sewers exist and sewage treatment must be undertaken, it is generally possible to install an intercepting sewer along the waterways with special regulating devices which will capture and divert to the intercepting sewer considerably more than the normal dry weather flow, and thus avoid pollution normally occurring from many points of discharge.

Street sewers are usually constructed of vitrified clay pipe in sizes from 8 to 24 in. in diameter. Larger sizes than 24 in. are customarily of reinforced concrete precast pipe up to 84 in. in diameter or larger. Monolithic reinforced concrete conduits poured in place are commonly used for sizes 60 in. and larger and may be other than circular in section. Combined sewers of 10 to 15 ft. width are not unusual in some of the larger cities. The brick and stone masonry construction formerly employed is now seldom used. Sometimes cast iron pipe in the smaller sizes is used where conditions demand greater strength and tightness. A recent development is the use of cement-asbestos pipes to reduce infiltration of ground water, or to maintain adequate velocity of flow where minimum grades are necessary. Sewers are designed for minimum leakage, and are laid on sufficient grade to be self-cleansing when flowing partly full.

The most significant development in sewerage within the last half century is the steadily growing practice of sewage treatment to eliminate the serious effects of the pollution of waterways. The former practice of discharging raw sewage indiscriminately into the streams and waterways is happily passing, although some important American cities still do so. The older methods of disposal of sewage directly to the land on "sewage farms" has practically disappeared in American practice and have been supplanted by compact modern works capable of effectively purifying sewage without any attendant local nuisance.

Generally speaking, the processes employed in treating sewage involve some or all of the following steps, according to the degree of purification required by the local circumstances: (1) screening for removal of rags and other gross floating matter; (2) skimming for removal of floating grease and oil; (3) sedimentation in tanks for removal of suspended solids; such removal usually amounts to between 50 per cent and 60 per cent of the total suspended solids. Sedimentation may be materially increased by the addition of precipitating chemicals, such as ferric salts and lime; (4) biological oxidation of the colloidal and dissolved impurities not capable of settling; and (5) disinfection for destruction of bacteria and harmful organisms. The first three steps are usually referred to as primary treatment, while the fourth step is usually referred to as secondary treatment. The latter may consist of trickling filters, intermittent sand filters, or the activated sludge process. The fifth step is employed in situations where it is necessary to protect the purity of the receiving stream or body of water, where water supplies, shellfish grounds, or bathing and recreational areas are involved. This step is generally accomplished by application of chlorine. Chlorination is also frequently used in other stages of the treatment process to control odors and to improve sedimentation. The settled solids from primary and secondary processes are subject to further treatment, such as sludge digestion, vacuum filtration, drying on sand beds, and incineration.

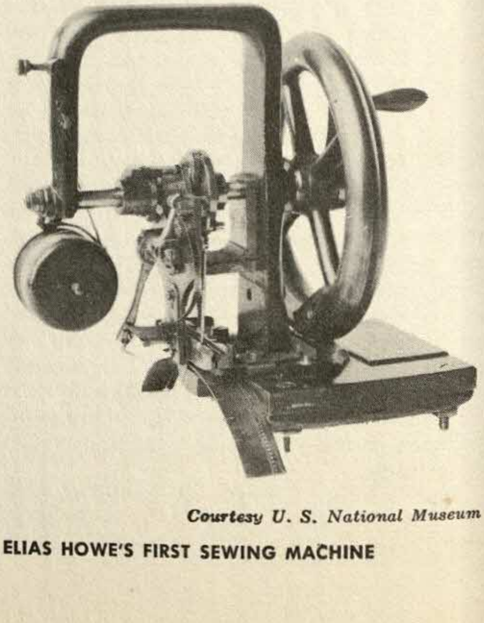
Many of the modern sewage-treatment works salvage some by-products from the treatment, the most important of which is a combustible gas derived from digestion of sewage solids or sludge in covered tanks. This gas, containing about 70 per cent methane, is utilized in internal-combustion engines or under boilers, and under favorable circumstances may be sufficient to meet all the power needs of pumping the sewage and operating the mechanisms of the treatment plant. Grease is in some instances captured and sold to soap makers. The residue from the digestion of sludge solids is inoffensive and largely used as a low-grade fertilizer or soil conditioner. In a few large cities like Milwaukee, Chicago, Pasadena, and Houston, the sludge solids without digestion are processed, artificially dried, and marketed as fertilizer. Liquid digested sludge is also used as a soil conditioner. Purified effluent is used for irrigation in arid regions, and to some extent for cooling water in industrial work. The recovery of sewage by-products, with the exception of the methane gas, is seldom a profitable undertaking. The revenues derived therefrom may generally be considered only as a partial offset of the cost of operating the treatment works.

Sewing Machine (*sō'ĭng mȧ-shēn'*), a machine for sewing or stitching fabrics, leather, paper, and other materials. At present many kinds of these machines are used in the manufacture of a large variety of products. Formerly all sewing was done by hand with needle and thread, and the first attempt to construct a machine sought to imitate the hand movements in sewing. The first sewing machine invented was made by a German named Charles F. Weisenthal, in 1755, who made use of a double-pointed needle, with the eye in the center, and two pairs of pincers alternately seized the needle and passed it above and below the cloth. This principle was utilized later by J. Heilmann in constructing an embroidering machine that he exhibited in Paris in 1834. An Englishman, Thomas Saint, obtained a patent in 1790 for a machine which was designed for sewing leather. There is no evidence that practical use was made of Saint's idea. In 1830, a Frenchman, Barthélemy Thimonnier, patented the first machine which was actually used for sewing. In 1832-34, Walter Hunt of New York constructed a machine for sewing, stitching, and seaming cloth, the forerunner of the present sewing machine. Elias Howe, of Cambridge, Mass., secured a patent, in 1846, for his *lock-stitch* machine, which employed an eye-pointed needle operating in conjunction with a shuttle. This stitch is now used in most machines, and the royalty received by Howe from manufactures amounted to about $2,000,000. Isaac M. Singer patented the first actually practical lock-stitch machine in 1851.

Two threads are used in the lock-stitch, the one being pushed through the cloth by the needle to form a loop at the lower side, while the other is on a bobbin within a shuttle or hook and is carried through the loop, thus forming a stitch that is securely locked and cannot be undone by pulling. Some machines use a *slide shuttle,* others have an oscillating shuttle, and still others employ a rotating hook that serves the same purpose.

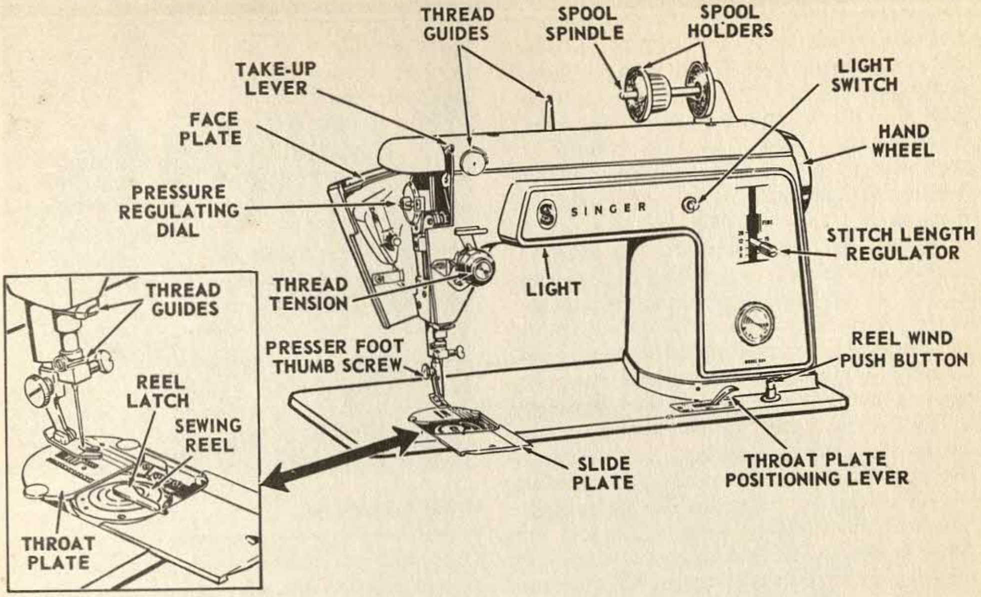
In 1849 John Bachelder invented a machine that made the *chain-stitch*. A major shortcoming of this machine was that the whole seam became undone if one end of the thread was pulled. Allan B. Wilson invented the rotary hook and bobbin long used in the Wheeler & Wilson machine and he also patented, in 1854, the four-motioned feed, which is now used in nearly all machines. A Virginian, James Gibbs, invented the first practical single chain-stitch sewing machine (1857).

Since then innumerable improvements have been made, and machines are employed for purposes so varied that it is impossible to enumerate more than a few of the more important. These include the sewing of ordinary textiles and carpeting. There are machines for sewing buttonholes, stitching shoes, sewing gloves, making satchels and mail bags, and hemming the finest textiles. In factories and book binderies machines are operated largely by electric and steam power. Formerly machines for family use were turned by hand after being fastened to a table by set-screws, but now they are mounted on a table, and



Courtesy U. S. National Museum

ELIAS HOWE'S FIRST SEWING MACHINE



Courtesy The Singer Manufacturing Co.

PRINCIPAL PARTS OF A MODERN SEWING MACHINE

worked by means of a treadle or by electricity.

Sex (*sĕḳs*), in biology, the classification of all living individuals, animals or plants, as either male or female beings. In the lower species this subdivision can be defined only by the role, active or passive, which the being plays in the reproduction of its kind. In more highly developed animals the sexes differ more definitely. The reproductive cells differ in the male and female, as do the organs which produce and eject them. The form of the body, the color of the skin, fur or feathers, and in higher animals the instincts, are unlike in male and female. See also *Birth; Child Guidance; Puberty*.

Sexagesima (*sĕḳ-sạ-jĕs′ĭ-mạ*), Latin meaning 60th, the second Sunday before Lent. It occurs on the 60th day before Easter.

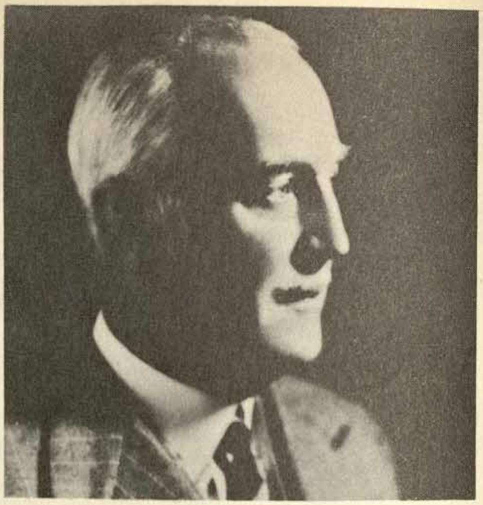
Sextant (*sĕḳs′tạnt*); an instrument used in surveying land and in astronomical and nautical observations, especially in measuring the angular distance between two objects. The sextant consists of a frame, usually of metal and ebony, made firm by cross braces. It has an arc of 60°, and by the use of two reflecting mirrors, one silvered entirely and the other silvered over half its surface, it includes a range of 120°. Other parts include an eyepiece, a movable arm to carry the fully silvered mirror and a vernier, and a graduated scale of degrees, minutes, and seconds. This instrument was invented by Sir Isaac Newton in 1672, but many improvements have been made. The arc of a sextant used for *astronomical* purposes is usually made in the form of a complete circle, when the instrument is known as a *reflecting circle*. In this form greater precision in the observations can be obtained. An *aircraft* sextant differs in many respects from the above described device, principally by the addition of a bubble chamber which represents an artificial horizon. The optical system consists of a rotating field prism, a fixed prism, and a reflector lens, through which the plane navigator takes "readings" of the elevation of the sun or other heavenly bodies.

Seychelles (*sâ-shĕl′*), a group of small islands in the Indian Ocean, about 675 m. N.E. of Madagascar. They include about 92 islands and islets, with a total area of 156 sq. m. Mahé, the largest of the group, contains 55 sq. m. These islands are mountainous, the highest summits being about 3,000 ft. above sea level, and coral reefs surround them. The climate is equable, with temperatures ranging from 74° to 88°, and the rainfall is quite heavy, ranging from 90 to 100 in. Coconuts, cinnamon, patchouli and other essential oils are the leading products. Salt fish, cacao, coffee, and fruits are exported. The islands, originally colonized by France, have been a British possession since 1794. Victoria, on Mahé, is the seat of government. Only four of the islands are inhabited; the people consist chiefly of Negroes and French Creoles. Population, 1949 (est.), 34,847.

Seymour (*sē′mōr*), a city in Jackson County, Indiana, 60 m. S. of Indianapolis. It is an important railroad junction, on the Baltimore & Ohio, the Cleveland, Cincinnati, Chicago & St. Louis, and other railroads, has a large local and jobbing trade, and is surrounded by a fertile agricultural and dairying country. The principal buildings include the Swope Memorial Art Gallery and Seymour Business Coll. The manufactures include furniture, fertilizer, flour, woolen goods, and machinery. The place was settled in 1852, incorporated as a town in 1864, and as a city in 1867. Population, 1940, 8,620; in 1950, 9,629.

Seymour, the name of a noble family of England, so called from St.-Maur in Normandy, whence the ancestors came to England. In the 13th century they acquired holdings in Monmouthshire and later added to these estates by conquests and by marriage. Sir John Seymour, the head of the family, in 1497, aided in suppressing the Cornish Rebellion. His daughter, Lady Jane Seymour, became the third wife of Henry VIII (*q.v.*) in 1537, the day after the execution of Anne Boleyn (*q.v.*). She was the mother of Edward VI (*q.v.*) and was prominent as a sympathizer of the Protestant Reformation. Thomas Seymour, fourth son of Sir John Seymour, married Catherine Parr, the widow of Henry VIII, but after her death was tried and executed for treason in 1549. His brother, Edward Seymour, was rapidly promoted and became Duke of Somerset in 1547. Subsequently he was made protector and governor of the young King Edward, but became unpopular and was beheaded on Tower Hill in 1552.

Seymour, CHARLES, educator and historian, born in New Haven, Conn., Jan. 1, 1885. After receiving his Ph.D. from Yale Univ. (1911), he taught there as an instructor in history. He became a professor (1918), was provost of the university (1927-37), and president of Yale (1937-50). He was actively interested in international affairs and served on many government committees. He was chief of the Austro-Hungarian division of the American Commission to Negotiate Peace after World War I, and in 1919 served as the U.S. delegate on the Rumanian, Yugoslavian, and Czechoslovakian territorial commission at the Paris Peace Conference. His writings include "Electoral Reform in England and Wales" (1915), "The Diplomatic Background of the War" (1916), "Woodrow Wilson and the World War" (1921), "The Intimate Papers of Colonel House" (4 vols., 1926-28), "American Diplomacy During the World War" (1934, rev. 1942), and "American Neutrality, 1914-17" (1935).


CHARLES SEYMOUR

Seymour, HORATIO, politician, born in Pompey Hill, N.Y., May 31, 1810; died in Utica, N.Y., Feb. 12, 1886. After attending local academies and a military school in Connecticut, he studied law in Utica and was admitted to the bar in 1832. He was elected a Democratic member of the New York legislature (1841), mayor of Utica (1842), again to the legislature (1843, 1844), and governor of New York (1852). Although defeated for the same office in 1854, he was re-elected in 1862. As governor, he opposed the emancipation proclamation and the draft act of 1863. He refused the Democratic nomination for the Presidency in 1864, but accepted in 1868, when he was defeated by Gen. Grant (*q.v.*), and shortly thereafter retired from public life. His efficiency and popularity are indicated by the fact that his defeats were always by narrow margins, once as small as 16 votes.

Sforza (*sfôr'tsä*), CARLO, COUNT, statesman, born at Montignoso di Lunigiana, Italy, Sept. 25, 1873; died in Rome, Sept. 4, 1952. Entering the diplomatic service of Italy in 1896, he represented his country for more than 20 years in increasingly important capacities. He was Italian signatory to many treaties following World War I. When Benito Mussolini (*q.v.*) and his Fascist party came into power in Italy in 1922, Sforza resigned his post as ambassador to France and thenceforth held the leadership of the democratic anti-Fascist faction in his country. He lived in Belgium for some time (1926-40) and took up residence in the U.S. in 1940. In 1943, after the Allies had landed in Italy, he returned to his native country and, in 1944, became minister without portfolio in the cabinet of Marshal Badoglio (*q.v.*). He was foreign minister of several postwar Italian governments and fervently supported projects aimed at the federation of Western Europe.

His many books include "Makers of Modern Europe" (1930), "Europe and Europeans" (1936), "The Real Italians" (1942), and "Contemporary Italy" (1946).

Sforza, FRANCESCO, Italian military leader, born in 1401, died March 8, 1466. His father was the Count Alberigo de Barbiano (1369-1424), founder of the Italian family of Sforza, so called from a band of *condottiere,* a class of soldiers noted for their daring. The Sforza family played an important part in the affairs of Italy in the 15th and 16th centuries, not only influencing the government of northern Italy, but also a number of powerful European sovereigns. Francesco succeeded his father in the office of constable of the kingdom of Naples under Queen Joanna II in 1424, and, as the custom permitted, fought under the sovereigns who gave the largest pay. At various times he fought for or against Venice, Florence, Milan, and the Pope. His success brought him into high standing with the Duke of Milan, whose daughter he married, and shortly after he obtained Ancona and Pesaro from the Pope. In 1450 he succeeded to the dukedom of Milan and as duke secured control of all Lombardy, besides a number of possessions south of the Po, and Louis XIV ceded Genoa and Savona to him. He possessed only a limited education, but patronized learning and encouraged the establishment of schools. Five dukes of the Sforza family succeeded him. Francesco II (born in 1492) was the last of the line, dying on Oct. 24, 1535.

Sgraffito Ware (*z'gräf-fē'tō wâr*). See *Chinaware.*

Shad (*shăd*), a variety of fish of the herring family, but differing from the herrings proper in having a longer and deeper body and notches in the upper jaw. Writers have described a number of species that are more or less widely distributed and are all esteemed for food. They inhabit the sea near the mouths of rivers and swim upstream in the early spring to spawn. The *American shad* is caught off the Atlantic coast from the Gulf of Mexico to Newfoundland and has been successfully naturalized and planted in the Pacific. It attains a length of 20 in. and a weight of 2 to 10 lbs. The best-known species of Europe are the *allice shad* and the *thwaite shad.* The former attains a weight of about 8 lbs. and has fine-flavored flesh, while the latter is smaller, weighing about 2 lbs., but its flesh is coarser than that of the allice. The shad is bred extensively by the fish hatcheries of the U.S.

Shaddock (*shăd'ŭk*), a tropical tree of the citrus family, sometimes called pomelo. It is cultivated for its fruit, which resembles the grapefruit, having a pale yellow color and a juicy pulp with a slightly acid taste. The shaddock is native to eastern Asia, whence it was brought to America by a Capt. Shaddock, for whom it was named. Many species have been obtained by propagation, several of which are cultivated in Florida, California, and the West Indies.

Shadow (*shăd'ō*), the obscurity of light within an illuminated region, caused by an opaque body intercepting the passage of light. The outline of a shadow depends upon the distance from the object upon which it is thrown, since the rays of light, by virtue of the properties of reflection, refraction, and dispersion, incline to bend around the opaque object; thus, an increase of the distance between the object and its shadow proportionately increases this action. Shadows also depend upon the intensity of light, as contrast is decidedly more marked in a strong than in a dim light. It is not unusual to apply the term *shadow* to an interference of any kind of radiation, as sound shadow and electric shadow.

Shadrach, Meshach, and Abednego (*shā'drăk, mē'shăk, ȧ-bĕd'nē-gō*), three men mentioned in the Old Testament (Daniel 3:12-30). They were friends of Daniel and because of their refusal to worship idols were thrown into a burning furnace, but miraculously rescued. They are frequently depicted in early Christian and Byzantine art.

Shadwell (*shăd'wĕl*), THOMAS, dramatist, born at Stanton Hall, Norfolk, England, about 1642; died at Chelsea, Nov. 19, 1692. He wrote "The Sullen Lovers" (1668) and many other comedies ridiculing the oddities of his time, including "The Virtuoso" (1676) and "The Squire of Alsatia" (1688). In 1688, he became poet laureate of England and royal historiographer. He attacked Dryden in "The Medal of John Bayes" (1682), and became himself the subject of that poet's mockery in Dryden's satire "Mac Flecknoe" (1682).

Shafter (*shăf'tẽr*), WILLIAM RUFUS, general, born at Galesburg, Mich., Oct. 16, 1835; died near Bakersfield, Calif., Nov. 12, 1906. After a public school education, he worked as a farmer until 1861 when he entered the Union army as a lieutenant. He distinguished himself under McClellan in Virginia, was made colonel of volunteers in 1864, and breveted brigadier general the following year. In 1886 he entered the regular service. He was promoted to brigadier general in 1897 and put in command of the department of California, serving until the beginning of the Spanish-American War, when he was made major general of volunteers and commanded the first expedition to Cuba. In May 1898, he proceeded to Tampa, Fla., and in June he landed with 16,000 men at Daiquiri, Cuba. He advanced toward the heights of El Caney and San Juan, and a few days later received the surrender of Gen. Linares with an army of 20,000 men. After the war he commanded the department of the East, but was transferred to the departments of California and the Columbia in 1899. He retired in 1901 with the rank of major general in the regular army.

Shaftesbury (*shăfts'bẽr-ĭ*), ANTHONY ASHLEY COOPER, FIRST EARL OF (known as LORD COOPER), born in Wimborne, St. Giles, Dorsetshire, England, July 22, 1621; died in Amsterdam, Holland, Jan. 21, 1683. He studied at Exeter Coll., Oxford,

Collection Museum of Modern Art, N. Y.

THE SHAKERS

From a 19th-century American lithograph

and Lincoln's Inn, London. He was elected to the Long Parliament in 1640 from Downton, Wiltshire. At first he supported Charles I but in 1644 shifted his allegiance to Parliament and supported Oliver Cromwell until 1654. When Cooper was re-elected to Parliament in 1660 he once more opposed Cromwell, and advocated the restoration of Charles II, becoming a member of the privy council when the latter assumed the throne in 1661. Cooper was created Earl of Shaftesbury and Lord Chancellor in 1672 and for a while enjoyed royal favor until he opposed the king's Catholic aspirations. Thereafter his anti-Catholic actions brought him increasing disfavor until he was arrested (1681) for treason and imprisoned in the Tower. Released on bail in 1682, he escaped to Holland where he died.

Shaftesbury, ANTHONY ASHLEY COOPER, THIRD EARL OF (known as Lord Ashley), philosopher and writer, born in London, England, Feb. 26, 1671; died in Naples, Italy, Feb. 4, 1713. He was the grandson of the famous 17th-century English statesman of the same name. Although he was somewhat different from his grandfather, the younger Shaftesbury also became a member of Parliament. However, he was primarily interested in philosophy, literature, and the arts. Originally a pupil of John Locke (*q.v.*), Shaftesbury differed from him in his basic ideas on ethics. His best-known work, "Characteristics of Men, Manners, Opinions, Times" (1711), is the treatise of a highly educated man of the world, who shared the interests of the 18th century in philosophical speculation.

Shag (*shăg*), the name frequently applied to several species of the cormorant. It has special reference to the bird which is known as the *crested cormorant,* which has a crest of feathers. See *Cormorant.*

Shagreen (*shȧ-grēn′*), a variety of untanned leather prepared by the natives of eastern Asia from the skins of camels, horses, and wild asses. The leather is easily colored and has a granular surface achieved by pressing seeds into the skin before soaking it. Another variety of shagreen is made from the skins of seals, sharks, rays, and sea otters. These skins, covered by small tubercles, are prepared like parchment and are finished by dyeing and smoothing.

Shah (*shä*), the title of the ruler of certain Middle Eastern countries, especially Iran.

Shahaptian (*shä-hăp′tĭ-ạn*). See *Sahaptin.*

Shah Jahan (*shä′ jạ-hän′*) or SHAH JEHAN, Mogul emperor of Hindustan, born *ca.* 1592; died 1666. He succeeded his father Jahangir in 1628 and during his rule annexed most of southern India. His reign is called the golden era of Indian architecture. He encouraged literature and art; founded Delhi, where extensive construction was carried on; and built the Taj Mahal (*q.v.*). Shahjahanpur (*q.v.*) was named for him. In 1658 his son Aurangzeb deposed him, imprisoning him at Agra for the remainder of his life.

Shahjahanpur (*shä-jạ-hän′po͝or*), a city in the state of Uttar Pradesh, India, on the River Deoha, *ca.* 90 m. N.W. of Lucknow. Founded in 1647 and named for Shah Jahan (*q.v.*), the city is a railroad junction. Its chief product is sugar. Population, 1951, 104,835.

Shaker Heights (*shāk′ẽr hīts′*), a residential suburb of Cleveland, Ohio. A Shaker colony (1820-89), it was made the site of a suburban development (1905). It was incorporated in 1912 as a village and in 1931 as a city. Population, 1950, 28,222.

Shakers (*shāk′ẽrz*), a communistic religious sect, whose official title is United Society of Believers in Christ's Second Appearing. It had its beginning in Manchester, England, about 1750, where it was first advocated by a tailor, James Wardley (or Wardlaw) and his wife Jane, and by Ann Lee (1736-84). The latter's first connection with ministerial work followed soon after coming in contact with Jane Wardley, who professed to be a prophetess. She asserted that she had received a call to testify to and spread the truth. The Wardleys were originally Quakers. Claiming a special revelation in regard to the second coming of Christ, they became estranged from some tenets of that faith and found an able advocate in Ann Lee.

The chief doctrine preached by these people was that the end of all things was near at hand, and that Christ would appear in the form of a woman and reign upon the earth. The meetings held in various parts of England attracted such crowds that the Wardleys and Ann Lee were imprisoned, and, after being released, the latter claimed to have been visited, while in prison, by Christ. She became recognized as the head of the Shakers and was called Mother Lee. She claimed to be the bride of the Lamb and said that she was the queen mentioned by David in the Psalms, but these pretensions were met with ridicule. Subsequently she claimed to have received a revelation to the effect that America was to be the foundation of the coming kingdom and that she and her followers should seek a home there. Accordingly she and seven disciples came to New York, and in 1774 made a settlement at Watervliet, N.Y., outside of Albany. Subsequently many other settlements were made in the U.S.

Among the chief tenets held by the Shakers is the dogma that the old law has been abolished and the new dispensation has begun. They believe that the Holy Ghost makes immediate revelations to mankind, that the kingdom of God is now at hand and intercourse between earth and heaven has been restored, that man is freed from all errors except his own and the sin of Adam is atoned, and that heaven is in fact upon earth and will be brightened into its primeval state by labor and love. They hold several tenets in common with the Quakers and with them object to taking oaths, reject sacraments, and refrain from the complicated courtesies of society. Jesus Christ is regarded as a divinely inspired man, representing the fatherhood of God, while Ann Lee was inspired to reveal to mankind the motherhood of God. Worship is conducted in churches, in which the worshipers step in uniform movements while singing hymns and listen to discourses on doctrine and duty. Celibacy is observed strictly. The society is recruited mostly from young men and girls. Married persons may join, but on entering, are enjoined to live as brother and sister. The membership has dwindled down to about 200.

Shakespeare (*shāk′spēr*), WILLIAM, the greatest of English poets and one of the greatest poets of the world. He was born in Stratford-on-Avon, Warwickshire, England, in 1564, and died Apr. 23, 1616. The exact date of his birth is unknown, but he was baptized in the parish church at Stratford on Apr. 26, 1564. There is a tradition, influenced perhaps by the date of his death, that he was born on April 23, and that date is usually celebrated as his birthday.

The uncertainty about the date of Shakespeare's birth is typical of our lack of definite knowledge about his life. His father, John Shakespeare, was a tradesman in Stratford, probably a glover, but he has also been described as a butcher and apparently took part in other trades as well. There is a very doubtful legend, first mentioned by John Aubrey in 1680, that Shakespeare in his youth butchered calves for his father, and "would do it in high style, and make a speech." Whether Shakespeare's father was a butcher or not, John Shakespeare held various municipal offices in Stratford, including the office of high bailiff, the chief office of the town. At one time he must have been a prosperous businessman, although later he seems to have lost his money. In 1596, application was made to the Heralds to establish the right of the family to a coat-of-arms and gentle status, and Shakespeare was known in his later years as "William Shakespeare, gentleman."

Shakespeare was married at 18, by warrant of a bond issued on Nov. 28, 1582, to a girl about eight years his senior. We know her as Anne Hathaway, but her name appears in different records as Agnes Hathwey and as Anne Whately. Three children were born of this marriage: Susanna, baptized on May 26, 1583, and Hamnet and Judith, twins, baptized on Feb. 2, 1585.

We know nothing of Shakespeare's formal education. He probably attended the free grammar school at Stratford, as tradition says he did. John Aubrey, who 64 years after Shakespeare's death reported that Shakespeare had made speeches to dying calves, also reports that Shakespeare, as a young man, taught school in the country. There is still another tradition that he served in the army. If either report is true, it was presumably between the years 1584 and 1592, during which period we have almost no facts about him. The presumption is that Shakespeare had little formal education, a presumption confirmed by Ben Jonson's judgment that he had "small Latin and less Greek." Whatever the limitations of Shakespeare's formal training, however, his plays are more than sufficient evidence that he was a man of wide reading, rich experience, and extraordinary insight.

Why Shakespeare left Stratford, when he left Stratford, why and when he went to London, again we do not know, although there are unverifiable tales of drinking bouts and poaching offenses that are said to have required his departure. These, like other legends about Shakespeare, are convincing as good fiction is convincing. They do not have the validity of biographical fact. Shakespeare is first heard of in London, in any event, in 1592, when he had already earned some reputation as an actor and playwright. During his later years he bought a home and other property in Stratford and apparently spent more and more time in his home town, apparently retiring from the theater and taking up permanent residence in Stratford sometime after 1610. Certainly almost all his work was done between 1591 and 1613.

Although there are dates that we know, it is not possible to determine with any certainty the

WILLIAM SHAKESPEARE

order in which Shakespeare's plays were written or even to what extent some of them were his own. Some of them were written in collaboration with other writers. Some were revisions of earlier plays by other writers, and most were based to some extent upon earlier works (plays, short stories, and histories). Many of the plays were probably revised from time to time for successive "revivals." Some were published in his lifetime (some in "pirated" unauthorized editions and others in authorized editions). Eighteen of the plays generally regarded as of Shakespeare's authorship were not published at all until 1623, in what is known as the "First Folio." This edition of 36 plays was sponsored by Heminge and Condell, two of Shakespeare's associates at the Globe Playhouse. It is, of course, of extreme importance in the determination of what Shakespeare wrote, but unfortunately the dates of composition are not indicated. We learn something of the dates of composition from Francis Meres' "Palladis Tamia," published in 1598, which includes a list of Shakespeare's plays. We learn from quarto editions of single plays the latest dates at which some of them could have been written. For the rest, we are dependent on internal evidence.

The plays listed by Meres, which must have been completed before 1598, are "The Two Gentlemen of Verona," "The Comedy of Errors," "Love's Labour's Lost," "Love's Labour's Won" (perhaps "The Taming of the Shrew"?), "A Midsummer Night's Dream," "The Merchant of Venice," "Richard II," "Richard III," "Henry IV" (presumably parts 1 and 2), "King John," "Titus Andronicus," and "Romeo and Juliet." Whatever part Shakespeare may have had in the composition of "Henry VI," parts 1, 2, and 3, they were certainly written early—probably before 1592. If we add to these "Henry V," "Much Ado About Nothing," "The Merry Wives of Windsor," "Julius Caesar," and "As You Like It," we probably have the list of 21 plays which were fairly certainly written by Shakespeare alone or in which he took a major part and which were completed before the end of 1600. To the new century we assign "Twelfth Night," "Hamlet," "Troilus and Cressida," "Measure for Measure," "All's Well That Ends Well," "Othello," "King Lear," "Macbeth," "Antony and Cleopatra," "Timon of Athens," "Pericles," "Coriolanus," "Cymbeline," "Winter's Tale," "The Tempest," and "Henry VIII" (of which we know Shakespeare wrote only part).

Shakespeare's plays may be conveniently classified (not always quite satisfactorily) into three groups: histories, comedies, and tragedies.

The histories are easily identified by their titles, which are the names of English kings. In these plays Shakespeare brought to its highest development a dramatic form already popular. Dealing with historical persons and events, and sometimes covering a large part of a reign, chronicle plays are characterized by relatively loose plot structure. Shakespeare's histories are notable for their improvement upon those of his predecessors in this respect, for his interest in and expert analysis of the characters of whom he writes, and for the eloquence with which he expresses the patriotic fervor that he shared with other Englishmen of the Renaissance. Indeed, Shakespeare's greatest gifts, the gifts which set his work apart from that of all other dramatists, are his ability to present complete portraits of notable characters and his extraordinary facility in the use of language. The best of his histories are usually thought to be "Henry IV," parts 1 and 2, largely because it is in them that we find Falstaff, Shakespeare's most famous comic character, but also because of the masterly antithesis of the characters of Harry Hotspur (Percy) and Prince Hal, and for the character of Henry IV himself.

Shakespeare's comedies, of which there are 17, vary greatly in kind and in quality. They include hilarious farce in "The Taming of the Shrew" and "The Merry Wives of Windsor," and lyriclike romance in "As You Like It," set in the forest of Arden. They give evidences of bitter disillusionment in "Measure for Measure," and of a calmer mood of acceptance in "The Tempest," more serious and sober than "As You Like It," but no less lyrical and no less romantic. Probably the best of the comedies, in their different moods, are "As You Like It," and "The Tempest."

Shakespeare's greatest achievement is in his tragedies, which include "Titus Andronicus," a melodrama so bad that some critics have doubted Shakespeare's authorship, "Romeo and Juliet," "Julius Caesar," "Hamlet," "Othello," "King Lear," "Macbeth," "Antony and Cleopatra," and "Coriolanus." "Romeo and Juliet," for its romantic love story and for the lyric quality of many of the speeches, is the favorite of some readers and is perhaps the play that should be read first by young readers. Although loosely constructed, "Antony and Cleopatra" is also notable for the lyric richness of its verse. But the greatest of the tragedies are "Hamlet," "Othello," and "King Lear," with "Macbeth" not far behind them. Nowhere in literature do we have more searching analysis of character, more complete mastery of expression, or better handling of intensely dramatic effects. These plays, written while Shakespeare was in his prime, his apprenticeship completed, reflect his rich and philosophic wisdom, his marvelous insight into the motives of men, his consummate mastery of stagecraft, and his unequaled eloquence. It is the consensus of critical opinion that "Hamlet," the longest and most complex of Shakespeare's four greatest plays, is the greatest of all our tragedies.

Although he is primarily a dramatist, Shakespeare would have made a place for himself among the ablest of English poets even if he had never written for the stage at all. His sonnet sequence, addressed to "Mr. W.H.," who has been variously identified, is among the best, if it is not indeed the best, of English sonnet sequences. The apparent personal tone of the sonnets, the thread of narrative extending through the sequence, and the urgent desire always to know more and more of Shakespeare as a man have led to varied and extensive attempts to find definite biographical significance in them. It is best, however, not to push this quest too far. The sonnets were not published until 1609, but they are mentioned by Meres in 1598 and are thus clearly among Shakespeare's early works. His other chief nondramatic poems, "Venus and Adonis" and "The Rape of Lucrece," both narratives, are also early works. It has been suggested that they were written during periods between 1592 and 1594 when the theaters were closed because of the plague and that they were attempts on Shakespeare's part to establish himself as a poet in an age in which dramatists were not highly regarded as men of letters.

Shakespeare's total achievement is so overwhelming that some writers have been reluctant to believe that it could have been the accomplishment of a man of Shakespeare's antecedents and background. Elaborate arguments have been put forward to prove his plays the work of Francis Bacon. Edward Vere, the Earl of Oxford, has also been suggested as the possible author. But among the many uncertainties about Shakespeare's life, at least one thing is sure: he is the author of the works that are attributed to him.

See also *Stratford-on-Avon.*

Shale (*shāl*), a class of rock, so named from its tendency to scale into thin sheets, formed from sediments deposited by waters and essentially unchanged by metamorphic action. A wide range is found in the color and composition of shale. Among the chief kinds are the calcareous, sandy, carbonaceous, and bituminous. The last mentioned yields naphtha, alum, paraffin, and other oils of importance commercially. Many well-preserved fossil remains are found in shales.

Shaler (*shā'lẽr*), NATHANIEL SOUTHGATE, geologist, born in Newport, Ky., Feb. 22, 1841; died Apr. 10, 1906. He studied at the Lawrence Scientific School of Harvard Univ., and in 1862, joined the Union army for service in Kentucky. In 1864 he was made instructor of zoology and botany in the Lawrence Scientific School, but resigned to become professor of paleontology at Harvard Univ. in 1867. This position he held until 1887, when he was made professor of geology. For some time he was director of the geological survey in Kentucky. His books include "Nature and Man in North America," and numerous other works.

Shallot (*shă-lŏt'*), a vegetable closely related to garlic with similar bulbs, used for flavoring and for pickles; also called scallion.

Shalmaneser (*shăl-mȧ-nē'zẽr*), the name of several kings of Assyria. Shalmaneser I, born about 1312 B.C., began to invade the western part of Asia and removed his capital from Asshur to Calah, south of the city of Nineveh. The second of these kings, Shalmaneser II, conquered the country as far as Lebanon. In 842 B.C. he made the Israelites, who were then governed by Jehu, tributary to Assyria. Shalmaneser IV, succeeded Tiglath-pileser in 727 B.C. Hosea, King of Israel, refused to pay tribute to him in 725 B.C., and so he invaded and destroyed that state. Later he laid siege to Samaria for three years, after which it was captured.

Shamanism (*shä'mạn-ĭz'm*), a religion embraced by a minority in northwestern Asia, usually classed with idol worship. Though it has no fixed idols, it includes a number of fetishes and ancestral images. The priest, known as the *Shaman,* has charge of certain ceremonies, such as sacrifices and incantations. These are practiced for the purpose of securing oracles and to purify the houses with defilement. The Shamanists believe in one god, whom they worship as the Supreme Being, and they hold to the view that the evil spirits of the lower world are sufficiently powerful to injure man, and therefore they con-

Courtesy Ewing Galloway, N. Y.

SHANGHAI BUSINESS SECTION

sider it necessary to use magical rites and spells to avert their harmful influences.

Shamokin (*shȧ-mō'kĭn*), a borough in Northumberland County, Pennsylvania, about 58 m. s. of Williamsport, on the Pennsylvania and the Reading R.R.'s. The surrounding country produces anthracite coal, cereals, and fruits. Among the manufactures are textiles, beef and pork products, shirts, and machinery. Shamokin was incorporated in 1864. Population, 1950, 16,879.

Shamrock (*shăm'rŏk*), a trifoliate plant used as the national emblem of Ireland. According to legend, St. Patrick demonstrated the doctrine of the Trinity by means of such a plant's three-part leaves. Of various plants used in this connection, the most common are the white clover, the wood sorrel, and a hop clover. In Ireland and among Irish communities elsewhere, it is the custom to wear or display the shamrock on St. Patrick's Day, March 17.

Shams-ud-Din Mohammed (*shŭms'ŭd-dēn' mō-hăm'ĕd*). See *Hafiz*.

Shamyl (*shăm'ĭl*), or SCHAMYL, SAMUEL, military leader of the Caucasus tribes, born at Aul-Himry, in the Russian government of Daghestan, about 1797; died in Medina, Arabia, in March 1871. After studying Arabian grammar and philosophy under the Mollah Jelaleddin, he became a leader of a Mohammedan sect and united a large Caucasian force against the Russians. The tribes of Daghestan soon recognized him as imam, or chief, and by skillful organization he succeeded in defeating a Russian army in 1837. His forces were defeated at the fortress of Akulgo and it was thought that he was among the slain. However, he soon reorganized his forces and continued operations as a formidable opponent to the Russians until 1859, when he was surprised and captured on the plateau of Ghunib, where he had built a fort. The Russians carried him to St. Petersburg, and assigned him a residence at Kaluga. In 1870, he went on a pilgrimage to Mecca as a parole prisoner.

Shanghai (*shăng-hä'ī*), a seaport city of Eastern China, in the province of Kiang-Su, on the Hwang-Pu River, 12 m. above the mouth of the Yangtse River. The city is divided into two parts, the ancient Chinese city proper, and the portion occupied by foreigners. Walls 24 ft. high and 3½ m. in circumference inclose the Chinese part of the city, which may be entered by six gates. Dating from 1015, old Shanghai is about 1 m. in diameter, has narrow, poorly drained streets, and native temples, shops, and bazaars. The modern settlement on the left bank of the Hwang-Pu, developed since 1842 from British and French concessions, lies north of the Chinese walls. It is well paved, and has numerous modern facilities. Many nationalities are represented in the International Settlement, but the majority are Italians, Americans, Germans, English, and French, and the government of this portion of the city is distinct from that of the Chinese part. It has a number of excellent buildings, including a fine cathedral, consular and municipal offices, hospitals, churches, libraries, and several educational institutions.

Shanghai has manufactures of paper, sailing vessels, earthenware, utensils, fans, matches, and textiles. The harbor is safe and commodious, having many extensive quay improvements and dry docks. It has an immense interior and foreign trade in rice, silk, tea, cotton, hemp, wheat, paper, chemicals, fruit, oils, tobacco products, wool, metals, and opium. Imports include machinery, metal goods, cotton and woolen goods, cigarettes, sugar, and other products.

Shanghai dates from remote antiquity, but its importance as a trade center began in 1843, when it was opened as one of the five treaty ports (*q.v.*) and for unrestricted settlements. The first railroad of China was opened here in 1876, but it was soon purchased and torn up by native authorities. An unprovoked naval attack against Shanghai was made by the Japanese in January 1932, and the city was captured by the Japanese on Nov. 8, 1937. With Shanghai under Japanese control, British forces were withdrawn from the city in 1940, and the U.S. Marines left in 1941. Heavily bombed during World War II, Shanghai was restored to China in September 1945, and was captured by the Chinese Communists in May 1949. Population, *ca.* 3,700,000.

Shannon (*shăn'ŭn*), the largest river in Ireland, which rises at the western base of the Cuilcagh Mts., and after a southwesterly course of 250 m. enters the Atlantic Ocean. It flows through a number of loughs or lakes, among them Allen, Doburg, Bofin, Ree, and Derg, and from Limerick it forms a broad estuary 70 m. in length. The Shannon is navigable for large vessels to Limerick and for small craft as far as Athlone. It is connected with Dublin by two canals. Among its tributaries are the Suck, Foyle, Fergus, and Brosna. Shannon Airport is located at Rineanna, on the north bank of the estuary.

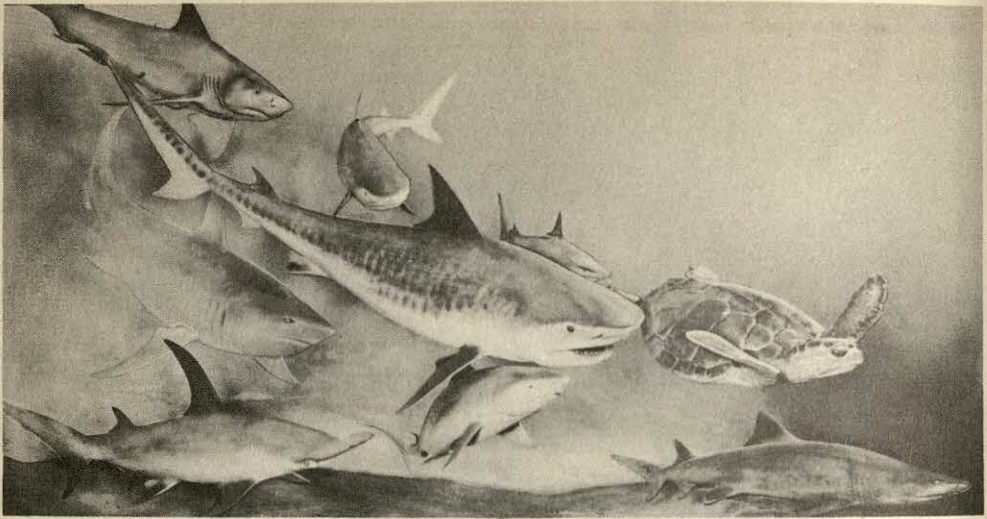
Shans (*shänz*), or LAOS, a group of native tribes occupying a region of Asia that lies between China, Siam, and Burma. They maintain a semi-independent status except in Siam, where they constitute the bulk of the population. They are early descendants from the Chinese, their ancestors having settled in the valley of the Irrawaddy about the 6th century. The region which they occupy is formed of numerous fertile valleys which contain productive fields and valuable forests; and the intervening ridges are noted for their deposits of petroleum, copper, coal, gold, silver, and other minerals. The people are skilled as manufacturers of jewelry, metalware, carpets, and various textiles. They carry on a considerable trade in these products, timber, and livestock. They cultivate rice, sweet potatoes, and cotton. Except for some Hindu colonies, the Shans are followers of the Buddhist faith.

Shansi (*shän-sē'*), a province of northern China, bounded on the east by Hopeh, north by Chahar and Suiyuan, west by Shensi, and south by Honan. The area is 60,491 sq. m.; the capital is Yangchu. The Hwang Ho is the principal river. A mountainous province with rich loess soil, Shansi produces wheat, millet, vegetables, fruit, and vines. The inhabitants raise cattle, and work local deposits of coal, iron, and salt. Between 1937 and 1940, Japan conquered all of Shansi province, but the Chinese opened a successful counteroffensive in the western part of the province in 1941. Following World War II complete control of the province was taken over by the Chinese Communist forces. Population, over 11,000,000.

Shantung (*shän-to͝ong'*), a peninsula forming a maritime province of northeastern China, bounded on the south by Kiang Su, south and east by the Yellow Sea, north by the Gulf of Pechili, northwest by Hopeh, and west by Hopeh and Honan. The area is 69,198 sq. m.; the capital, Tsinan; and the chief river, the Hwang Ho. A mountainous province, fertile only in the northern part, it forms along the Hwang Ho a densely populated plain where grain, cotton, hemp, and poppies are cultivated. Coal and iron are mined. There is a silk and glass industry; pottery-making and straw-plaiting are carried on. The district of Weihaiwei, comprising 285 sq. m., was leased by Great Britain in 1898, but was restored to China in 1930. Germany leased (1898) the coastal district of Kiaochow, containing 200 sq. m., but Japanese troops occupied the zone in 1915, and restored it to China in 1922. Shantung province fell to the Japanese (1938) during the Sino-Japanese War, and was not restored to China until 1945. It came under control of the Chinese Communist forces in 1948. Shantung has given its name to a silk dress material with a rough surface, sometimes mixed with cotton. Population, over 38,000,000.

Shapley (*shăp'lȳ*), HARLOW, astronomer, born in Nashville, Mo., Nov. 2, 1885. Shapley became associated with the Mt. Wilson Observatory in California in 1914, but accepted an appointment as director of the observatory at Harvard Univ. in 1921. His researches in photometry, spectroscopy, and cosmogony have won him many honors, including the presidency of the American Acad. of Arts and Sciences (1939). Among his most notable discoveries are his fixation of the exact center of the universe, now known as the Shapley Center, and the theory that stars are constantly fed by showers of meteors.

Shaposhnikov (*shä-pŏsh'nĭ-ḳŏv*), BORIS MIKHAILOVICH, army officer, born in Zlatoust, Russia, in 1882; death reported from Moscow, March 27, 1945. A colonel in the Russian army in World War I, Shaposhnikov was later credited with many of the Bolshevik victories during the civil war, 1917-21. From 1928 to 1931 and again in 1937 and 1941, he served as chief of the general staff of the Red Army. After the successful attack on the Mannerheim Line in



Courtesy American Museum of Natural History, N. Y.

SHARK GROUP

Finland in 1940, he was made a marshal of the Soviet Union. After Russia became involved in World War II, he planned the campaigns of 1941 and 1942. Though they primarily involved retreat, they saved Russian manpower and ultimately led to the successful counterattacks which drove the German invaders from Russia. He was named commander in chief of the Red Army and Air Force in October 1942, but later in the same year became ill and was forced to retire. He was a noted writer on military strategy and his "The Brain of the Army" was favorably compared with the writings of the great German strategist Clausewitz (*q.v.*).

Share (*shâr*), a portion or part In financial parlance, a share is an equal division of the capital stock of a property, company, or corporation. Each owner of a share of stock is entitled by law to the same rights, interest, and benefits as other shareholders in the company. See also *Securities.*

Sharecropper (*shâr′krŏp-ẽr*), a farmer who works on the land of a planter and shares the proceeds of the crops he produces. The term is applied to the class which arose in the South during the reconstruction which followed the Civil War. The sharecropper is usually given a cabin and buys his necessities and farm supplies on credit from the owner's commissary. He attempts to pay for these supplies and to earn whatever surplus he can from the sale of his share of the crops.

Sharett (*shă-rĕt′*), MOSHE, formerly MOSHE SHERTOK, Israeli statesman, born in Kherson, Russia, Oct. 3, 1894. As a member of the Jewish Agency (the organization which represented the Palestinian Jews under the British mandate), he played a leading role in the winning of a Jewish national home in Palestine. He was appointed the Agency's political secretary (1931), and later became a member of its political department (1935). As an Agency officer he represented Jewish interests in Palestine and argued the case for a Jewish national home before the British mandatory government and the U.N. With the formation of Israel (*q.v.*), Sharett was foreign minister (1948-56) and chief delegate to the U.N. General Assembly. In 1954-55 he was prime minister.

Shari (*shä′rê*), or CHARI, a river of Central Africa, the most important flowing into Lake Tsad. It rises, in several branches, north of the Belgian Congo and, after a course of 1,400 m. toward the northwest, through a forested region, enters the lake by several mouths.

Shark (*shärk*), an extensive genus of fish of the ray family, found widely distributed in the ocean, but most abundantly within the tropics. The body is elongated in most species, the tail is thick and fleshy, and the teeth are generally large, sharp, and formed for cutting. The skin is scaleless, but usually is very rough with thornlike tubercles, and is used in making shagreen. They swim with great speed for long distances, often pursuing ships for the sake of securing the offal and waste materials thrown overboard. Some deep-sea species attain an enormous size and are noted for their voracity in devouring other forms of sea life. All species are more or less destructive of food fishes and do immense damage to the fisheries. The most powerful of the man-eating sharks is the *white shark,* or *man-eater,* of the warm seas. It is found in the waters off the southerly coasts of the U.S., where it attains a length of 40 ft. It scents food for some distance and is readily attracted by blood or decomposing bodies. Other large species of sharks are the *tiger shark*, the *blue shark*, the *hammerhead shark*, and the *common dusky shark*. The flesh of some species is eaten, the liver yields an oil, and the hide is serviceable in polishing fine-grained wood and in covering the hilts of swords to make the grasp firmer.

Sharon (*shâr′ŭn*), a city in Mercer County, Pennsylvania, located on the Shenango River, 75 m. N.W. of Pittsburgh. It is served by the Erie, the Pennsylvania, the New York Central, and the Pittsburgh & Lake Erie R.R.'s. The manufactures include electrical transformers, steel and steel products, railroad parts, anchor chains, steel tubing, corsets, tank cars, and oil drums. The town's features include a park of more than 300 acres, a gift of Frank Buhl, a local industrialist and philanthropist, who also donated boys' and girls' club buildings. Sharon was settled in 1795, incorporated as a borough in 1841 and as a city in 1918. The city has a commission form of government. Population, 1940, 25,622; in 1950, 26,454.

Sharp (*shärp*), WILLIAM, Scottish writer, born in Paisley, Sept. 12, 1856; died in Castello di Manlace, Sicily, Dec. 12, 1905. He studied at Glasgow Univ., lived in Australia (1877-78), became a bank clerk in London, and later traveled extensively abroad. He wrote biographies of Dante Gabriel Rossetti, Shelley, Browning, and Heine. He also wrote collections of poems such as "The Human Inheritance," "Earth's Voices," "Romantic Ballads and Poems of Phantasy," and the novels "Children of Tomorrow" and "Wives in Exile." Beginning in 1894, he wrote under the pseudonym of *Fiona Macleod* tales of the Celtic world and became the champion of the Celtic literary renaissance, including "Pharais, a Romance of the Isles," "The Mountain Lovers," "The Sin-Eater," and "Winged Destiny."

Sharpsburg (*shärps′bûrg*), a borough in Allegheny County, Pennsylvania, 5 m. N.E. of Pittsburgh, on the Allegheny River. It is on the Pennsylvania and the Pittsburgh & Western R.R.'s and is surrounded by a productive coal and iron mining region. The manufactures include brick, glass, machinery, and lubricating oil. The region was first settled in 1826 and the borough, named after its founder, James Sharp, was incorporated in 1841. Population, 1950, 7,296.

Shasta Dam (*shăs′tȧ dăm*), constructed by the Bureau of Reclamation, is the second most massive concrete structure ever built. Only Boulder Dam exceeds it in height, and only Grand Coulee Dam in the amount of concrete. Shasta Dam is located on the Sacramento River, 12 m. N. of Redding, Cal. It is the principal feature of the Bureau's Central Valley Project in California which, when completed, will assist in providing additional irrigation water to approximately 2,100,000 acres of land, hydro-power, navigation improvements, flood and salinity control, municipal water supply, and other benefits. The dam is a curved gravity-type concrete structure, with a maximum height of 602 ft. above bedrock. At its crest, it is 3,500 ft. long. The base is 585 ft. thick; this tapers to a width of 41.5 ft. at the top. Shasta Reservoir, created by the dam, has a storage capacity of 4,500,000 acre-feet. This is sufficient to store more than a year's flow of the Sacramento River.

The power plant at Shasta Dam is built at the base of the dam. The power is essential to the operation of the pumping plants on the river-

Courtesy Californians, Inc., San Francisco

MOUNT SHASTA

type canals which will carry the irrigation water to the lateral canals and then to the land. Power will be distributed and sold to domestic, commercial, and industrial users. The Shasta power plant has five 75,000-kilowatt generators, and two 2,000-kilowatt station service generators, providing a total installed capacity of 379,000 kilowatts of energy. A system of transmission lines is under construction to carry the power output of the project to the pumping plants and load centers. A 230-kilovolt main line from Shasta to Oroville has already been completed; two additional 230-kilovolt circuits are under construction for the west side of the Sacramento Valley. Power from the plant is marketed by the Bureau of Reclamation. During the fiscal year ended June 30, 1950, the plant produced 1,447,023,300 kilowatt-hours of energy.

The Keswick Power Plant eight miles downstream is operated by water released from Shasta Dam. It has an installed capacity of 75,000-kilowatts and was put into operation on the Central Valley power system in 1950. During 1950 Shasta and Keswick power plants combined produced 1,559,064,300 kilowatt-hours of energy which brought a gross revenue of $9,340,727.

A notable feature involved in the construction of Shasta Dam was the relocation of approximately 30 m. of Southern Pacific R.R. main line track.

Shasta (*shăs′tȧ*), MOUNT, an elevated peak of California, near the northern boundary of the state in the Sierra Nevada Mts. It is 14,161 ft. high. Mt. Shasta is an extinct volcano and has an abundance of snow at the summit. The lower slopes are well wooded.

See preceding page for illustration.

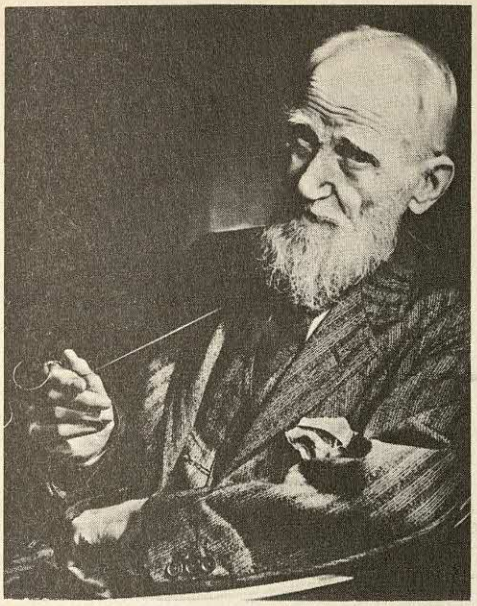
Shaw (*shą*), ANNA HOWARD, woman suffrage leader, born at Newcastle-on-Tyne, England, in 1847; died in 1919. Brought to the U.S. in childhood (1851), she grew up in this country and was one of its first prominent career women, being a licensed physician (Boston Univ. Medical School, 1886), and the first woman minister of the Methodist Episcopal Church (1880). In 1885, she became interested in woman suffrage and was well known as a lecturer and worker for the feminist cause until the time of her death. For 11 years she directed the movement as president of the National Woman's Suffrage Assn. (1904-15).

Shaw, GEORGE BERNARD, playwright, critic and novelist, born in Dublin, Ireland, July 26, 1856; died in Ayot St. Lawrence, England, Nov. 2, 1950. His father was a rather unsuccessful and poor grain merchant. Young Bernard Shaw was tutored by one of his uncles, the vicar of St. Bride's, Dublin, and then entered the Wesleyan Connexional School. As his mother was a talented amateur singer, he made an early acquaintance with music and the theater. He was apprenticed to a land agent on leaving school, but as this occupation was not to his liking he went to London (1876) to join his mother, who had long since separated herself from the poverty at home to become a music teacher. Shaw tried his hand at all kinds of commercial writing. Five novels (1879-83) were rejected by publishers, but in 1885 he went to work as music critic for the *Star*. Later, under the pen name of Corno di Bassetto or the initials G.B.S., he wrote critical pieces on music, art, drama, and books for the *World*, the *Saturday Review*, and the *Pall Mall Gazette*.

In this period, however, he was chiefly interested in politics and at the age of 26 declared himself a Socialist. Under the influence of Henry George and the Marxian theories, he became a charter member of the Fabian Society and proved himself an excellent speaker and writer of political tracts. He considered himself a Socialist and throughout his career gave voice in one way or another to his social theories.

During his convalescence from a breakdown from overwork in 1898, he married Charlotte Frances Payne-Townshend, a well-to-do Irish girl of good family. He had begun to publish some of his plays several years earlier, and although these received high praise for their philosophical and social content they were not successfully produced in London until after the turn of the century. By 1910, however, his plays had become the rage of London, New York, and Berlin, and Shaw took his place as a great dramatist. He received the 1925 Nobel Prize for literature. Some of his earlier plays, "Candida" (1897), "Man of Destiny" (1898), "Caesar and Cleopatra" (1900), "Man and Superman" (1903), "Major Barbara" (1905), "Androcles and the Lion" (1912), and "Pygmalion" (1912) have remained popular for almost half a century. Three of his greatest plays, "St. Joan," "Back to Methuselah," and "Heartbreak House," were not written until he was past 60.

A consummate artist and stylist, as well as a master of the finest prose, Shaw had perhaps an even greater appeal as a thinker and a personality. His plays, whether they are historical or based on the features of contemporary society, always have a personal message to convey to his public. Highly unconventional, often picturesque and full of incongruities, they are stimulating, frequently satirical, observations on the various facets of the social structure. Shaw was perhaps one of the most eccentric and legendary figures of modern times, but beneath the "mask" always attributed to him he was a magnificent wit and a profoundly independent thinker with a marvelous perception of the life of his times. It was almost impossible, at least during his life, to separate truth from legend, but his written works were



Courtesy British Information Services, N. Y.

GEORGE BERNARD SHAW

ample testimony of his thought and development. Mention must also be made of the prefaces to his plays. In these, he seized further opportunity to express his ideas on all manner of subjects; marriage, the medical profession, vivisection, politics, censorship, religion, vegetarianism, alcohol, and social evils of all kinds.

In other writings, novels, pamphlets, and newspaper articles, he has not hesitated to express his views on the conduct of both World Wars, international affairs, and the Irish question.

Among his best-known political writings are "The Intelligent Woman's Guide to Socialism and Capitalism" (1928), "The Political Madhouse in America and Nearer Home" (1933), and "Everybody's Political What's What" (1944), the latter an inquiry into the causes of two World Wars.

In his eighties at the beginning of World War II, he enjoyed renewed popularity with the production of two new plays. "Geneva" and "In Good King Charles' Golden Days" were produced on Broadway in 1940 and 1942, respectively. Gabriel Pascal, the English producer, has filmed three of his best plays, "Pygmalion" (1938), "Major Barbara" (1940), and "Caesar and Cleopatra" (1944). Shaw wrote his own scripts for these films.

Shaw, HENRY WHEELER, humorist, best known as *Josh Billings,* born in Lanesboro, Mass., Apr. 21, 1818; died in Monterey, Cal., Oct. 4, 1895. His father, Henry Shaw, was a member of Congress from 1818 to 1821 and provided for his entrance into Hamilton Coll. in 1832. The son soon left college to become a deck hand on an Ohio River steamboat, and afterward engaged in farming and as an auctioneer. He settled in Poughkeepsie, N.Y., in 1858, and the following year published his popular "Essay on the Mule" over the pen name of *Josh Billings.* He soon became a lecturer, delivering his addresses in an awkward, backwoods dialect, which he also utilized in his writings. Among his published works are "Josh Billings' Farmers' Allminax," "Josh Billings on Ice," "Josh Billings' Spicebox," "Josh Billings, His Sayings," and "Josh Billings' Complete Works."

Shaw, ROBERT GOULD, soldier, born in Boston, Mass., in 1837; died at Ft. Wagner, S.C., July 18, 1863. He enlisted as a private in the Union army at the beginning of the American Civil War, but demonstrated such ability that he was rapidly promoted through the ranks and soon was commissioned a colonel in the 54th Massachusetts volunteers, the first Union regiment of colored soldiers from a free state. He met his death at the head of his troops in the attack on Ft. Wagner. The Augustus St.-Gaudens monument which commemorates his heroism is one of the landmarks of Boston Common.

Shawl (*shąl*), a garment or wrap worn as an outside covering of the person, generally used by women, but in some countries also by men, as among the Scottish Highlanders. Garments of this class have been used as apparel from remote antiquity, but they were not generally introduced until about the middle of the 16th century, when the celebrated cashmere shawls became an important article of commerce. They are usually made of a square of cloth or as a large, broad scarf, and the materials consist of wool, cotton, silk, hair, lace, or a mixture of fibers. Cashmere shawls made of the under wool of the cashmere goat of Tibet were the first worn in Europe, and their designs have been imitated in woven shawls.

Shawnee (*shą-nē′*), a city in Pottawatomie County, Oklahoma, 38 m. S.E. of Oklahoma City. Located at the intersection of U.S. Highway 270 and State Highway 18, Shawnee is served by three railroads, the Rock Island, the Santa Fe, and the Oklahoma City, Ada & Atoka. The soil of the surrounding country is rich, producing alfalfa, corn, cotton, peanuts, and feed crops. It is at the edge of a large blackberry-producing section. Oil and gas are produced in large quantities, and there are manufactures of flour, dairy feed, powdered eggs, church furniture, and work clothes. Shawnee is the seat of Oklahoma Baptist Univ., which has an enrollment of some 1,000 students. Settled in 1891, the city was incorporated in 1894. Population, 1940, 22,053; 1950, 22,948.

Shawnees (*shą-nēz′*), an Indian tribe of North America, belonging to the Algonquin language group. In the 17th century, some of them were driven from the Cumberland region to the Scioto River region, where they were joined by other Shawnees some time later. Allies of the French in the French and Indian Wars, they joined Pontiac's conspiracy (1763-64) and took part with the Miami Indians in their war with the Americans (1790-95). The Shawnees joined in signing the treaty of Greenville in 1795. Allied with the British in the War of 1812, they had already been led by their chief, Tecumseh (*q.v.*), into a conflict in the Detroit area which ended only with his death. By 1831 the Shawnees had ceded their lands and moved to the west.

Shays (*shāz*), DANIEL, soldier, born in Hopkinton, Mass., in 1747; died in Sparta, N.Y., Sept. 29, 1825. A veteran of the Revolutionary War, in which he attained the rank of captain, Shays was a leader of the 1786-87 Shays' Rebellion. A group of several hundred Massachusetts insurgents suffering from the postwar economic depression had attempted (Aug. 29) to prevent the courts from rendering decisions in tax cases. On Sept. 26 they tried again, under Shays' leadership; a compromise ended their encounter with the state militia in Springfield. Their attempt (Jan. 25, 1787) to get arms from the arsenal at Springfield was foiled by Maj. Gen. William Shepard and a militia force. Pursued to Petersham, the insurgents were dispersed, and many were captured, by forces under Gen. Benjamin Lincoln on Feb. 2, 1787. Shays, who escaped to Vermont, was pardoned in 1788 and was later granted a Federal pension for his service in the Revolution.

Sheba (*shē'bạ*), the Old Testament name for SABA, a kingdom of ancient Arabia on the site of modern Yemen. The Sabaeans were a Semitic people who were widely known as merchants and slave traders. Their camel caravans carried such precious wares as gold, jewels, perfumes, and spices to bazaars throughout the Middle East. The kingdom enjoyed its greatest power in the period from 1000 to 700 B.C.; it fell to the Moslems in the 7th century A.D.

The most famous ruler of the Sabaeans was the Queen of Sheba, whose visit to Solomon (*q.v.*), king of Israel, is told in the Old Testament (I Kings 10:1-13; II Chronicles 9:1-12). The 1,200-m. journey to Jerusalem was probably for the practical purpose of arranging a trade agreement and political alliance, but it was surrounded by all the pomp of the two rulers' wealthy kingdoms. According to tradition, the queen became a wife of Solomon and bore him a son, Menelek; the modern dynasty of Ethiopia claims descent from Menelek.

Shearwater (*shēr'wạ-tẽr*) or HAGDON, a web-footed bird of the genus *Puffinus,* of the petrel family, which is found widely distributed over the seas. The shearwater is about the size of a pigeon; in color it is brownish above and white below. Among the many species are the *sooty shearwater* of the North Atlantic, the *Manx shearwater* of Western Europe, the *dusky shearwater* of the West Indies, and the *black-tailed shearwater* of the southern oceans. The birds frequent land only during the breeding season, at which time single white eggs are laid in holes in the ground. The young are covered with long thick down and are usually very fat. Of the species found near the islands of the Pacific Ocean, some are used as food and are called *muttonbird.* The shearwater is named for its graceful, skimming flight.

Shebat (*shẹ-bät'*), fifth month of the Jewish civil year and 11th month of the ecclesiastical year, having 30 days and corresponding to the period of early January to early February.

Sheboygan (*shē-boi'gạn*), a city in Wisconsin, seat of Sheboygan County, 50 m. N. of Milwaukee. It occupies a fine site on Lake Michigan, near the mouth of the Sheboygan River, and is on the Chicago & North Western R.R. The port is open all year long, being one of the busiest Great Lakes ports. Among the features are Vollrath Park, with its zoo, Evergreen Park, where the city maintains a children's camp, and the nearby Kohler Village. Sheboygan's manufactures include plumbing fixtures, furniture, leather, flour, enamelware, lumber products, machinery, and shoes. It has a large trade in lumber, fish, and agricultural products of the surrounding area. The first permanent settlement was in 1838. During the 1840's large numbers of Germans settled here. Sheboygan was incorporated in 1853. Population, 1940, 40,638; in 1950, 42,365.

Sheean (*shē'ạn*), (JAMES) VINCENT, writer, born in Pana, Ill., Dec. 5, 1899. He attended the Univ. of Chicago and then became a newspaper reporter, working first in the U.S. and later (1922-25), for the Chicago *Tribune,* as foreign correspondent in Europe. He then traveled throughout the world as a free-lance correspondent, reporting on such events as the revolution in China (1927), the Arab-Jewish riots in Palestine (1929), the Spanish Civil War (1938), and the events leading up to World War II.

His first book, "An American Among the Riffi," was published in 1926, but he did not gain national recognition until 1935 with the publication of "Personal History." In this book, he combined personal experiences and political journalism in a style which was adopted by many authors of the period. He also wrote novels, short stories, and biographies, including "Sanfelice" (1936), "This House Against That House" (1946), "Lead, Kindly Light" (1949), "Mahatma Gandhi" (1955), and "Orpheus at Eighty" (1958).

Sheen (*shēn*), FULTON J(OHN), Roman Catholic prelate, born in El Paso, Ill., May 8, 1895. He was educated at St. Viator Coll. and in 1919 was ordained a priest. He then studied at St. Paul Sem., the Catholic Univ. of America, at Washington, D.C., and received his Ph.D. degree in 1923 from Louvain Univ. in Belgium. In 1926 he joined the philosophy faculty of the Catholic Univ., where he remained until 1950, when he became director of the Society for the Propagation of the Faith. He gained national fame as a speaker on the "Catholic Hour," a radio program (1930-52), and through a television series (1952-57) entitled "Life is Worth Living." He also wrote columns (*e.g.*, "Bishop Sheen Speaks") and published "Life is Worth Living" in book form. He is known for his conversion of public figures and as an active opponent of Communism. He was appointed papal chamberlain in 1934 and domestic prelate in 1935 and was consecrated bishop in 1951 (becoming an auxiliary bishop of New York). In his books, Bishop Sheen presents theological discourses as well as popular religious topics. His works include "God and Intelligence" (1925), "Religion Without God" (1928), "Peace of Soul" (1949), and "Life of Christ" (1958).

Sheep (*shēp*), an important and useful class of ruminant animals, which are closely allied to the goat, but differ from it in having horns somewhat twisted with transverse ridges. The horns are hollow, but are sometimes lacking in females. Few animals are of greater value to man than sheep, since their flesh is a nutritious food, their skin is useful for leather, parchment, and robes, their wool is of value in making staple clothing. Their milk is used, in some countries, for making butter and cheese. The meat of the young is known as *lamb,* and that of the adult, as *mutton.* The male sheep is called a *ram,* the female, a *ewe;* the young is termed a *lamb,* and a number is called a *flock.*

Sheep have been domesticated from remote antiquity, Abel being mentioned in Genesis as a keeper of flocks of sheep. It is impossible to ascertain whence the domestic stock came, since they were introduced into Western Europe before the historic period, but it is thought that their nativity is in the mountain regions of Asia. Wild sheep are essentially mountain animals, several species being still found in the mountains of Central Asia, but animals of the wild stock are much smaller than cultivated species and have greatly inferior wools. A species intermediate between a sheep and a goat is found in the mountains of North Africa. Sheep are gregarious, in both the wild and the domesticated state. The ram is noted for its strong forehead, with which it is able to butt with considerable force against a foe.

Sheep culture was first introduced into America in 1609. It rapidly developed as an extensive industry, largely for the reason that sheep may be kept profitably on rough lands which are of little service except for pasturage, and because sheep are able to endure extremes of temperature. The ewe frequently brings forth twins, but usually only one pair at a birth, and the lambing season occurs generally in the early spring. Common grades of sheep include the Southdown, Shropshire, Cheviot, Delaine, Dorset horn, Leicester, Hampshire Down, Lincoln, Cotswold, Rambouillet, Silesian and Saxon. The *broadtail sheep* of Asia is remarkable for its large tail; the coat of the newborn lamb of this breed is highly valued as fur. The *Wallachian sheep* is noted for the size of its horns, and the *Iceland sheep* for having from three to five horns. A large percentage of the sheep reared in the U.S. are Merinos (*q.v.*), noted for their silky and fine wool. This breed was first introduced from Spain in 1801. The most extensive development of the sheep industry in the U.S. is in the arid regions of the West, but many sheep are reared in New York, Ohio, Pennsylvania, and some central states. About 9,250,000 head are slaughtered annually in the U.S. Ontario, New Brunswick, and Alberta rear many sheep. Australia, Central Asia, and various parts of Europe are among the principal foreign sheep-growing regions. See *Wool.*

Sheep Dog (*shēp dôg*), or COLLIE, any dog of several varieties which control and guard cattle or sheep. It is a hardy dog with long hair and high intelligence, and has been known for centuries. See also *Shepherd Dog.*

Sheep Laurel (*shēp lạr′ẹl*), a North American dwarf shrub, resembling mountain laurel, but with smaller bright red flowers and narrower leaves. It is supposed to be poisonous to sheep and other small animals.

Sheepshead (*shēps′hĕd*), a spiny-rayed food fish common to the Atlantic coast of North America, so named from the shape and color of its head. It is highly esteemed for the table, and is caught by nets. The size is from 20 to 30 in. and the weight ranges from 8 to 10 lbs. The food of the sheepshead consists of shellfish and crustaceans, which it crushes with its teeth. Among the allied species are the butterfish, the moonfish, and the fresh-water drum. The moonfish has a light gray color, a short and thick body, and a length of about 20 in. It is caught chiefly in nets, since it is skilled in biting off the line with its sharp incisors.

Sheeptick (*shēp′tĭk*), an insect belonging to the family of horse flies, often troublesome to sheep. It is wingless, with a flattened body, broad head, and long proboscis, and is parasitic on the body of sheep. The female attaches its pupae to the wool of the sheep. They soon begin to develop and to extract blood by fixing their heads in the skin of the sheep. These pests are destroyed by spraying the sheep with insecticide. Sheep louse is another name for the same insect.

Sheffield (*shĕf'ēld*), a city of England, in Yorkshire, at the confluence of the Don and Sheaf Rivers, about 159 m. N. of London. It has railway and canal facilities. Among the notable buildings are the Cathedral of SS. Peter and Paul, dating from the reign of Henry I, St. George's Museum, Wesley Coll., Firth Coll., Ranmoor Coll., and the Church of England Educational Inst. Sheffield manufactures iron and steel products. Since the 14th century the city has been world famous for cutlery; Chaucer mentions it in his "Canterbury Tales." Its other industries include silver- and electroplating, engineering, food-processing, and typefounding. The city's fame as a steel center began in 1740 with Benjamin Huntsman's invention of the crucible. The advent, in 1859, of Bessemer's (*q.v.*) process for the manufacture of mild steel made possible a tremendous expansion of the steel industry in the city of Sheffield, where Bessemer established his plant.

Sheffield was founded by the Saxons, but its site had long been used as a Roman garrison. Edward I granted the charter in 1296. The city's castle, now destroyed, was the scene of many bloody sieges in the Middle Ages, and Mary, Queen of Scots, was imprisoned there in the 16th century. Sheffield's importance as a trade and manufacturing center dates from the early part of the 19th century. Sheffield became a city in 1893. Population, 1950 (est.), 513,000.

Sheffield Plate (*shĕf'ēld plāt*), a process of plating (coating) copper with silver, discovered by a Sheffield cutler, Thomas Boulsover, around 1740. A copper foundation is coated with silver, giving the pieces the appearance of being made entirely of the more precious metal. Boulsover first produced buttons, boxes, and buckles, but later the production of tableware and other domestic articles was added. This original fusion process was replaced later by the electrolytic method of plating copper with silver, and is now practically a lost art. "Old Sheffield Plate" was often of such high artistic value and superb workmanship that such pieces have become valuable collectors' items. The newer product, known as "Sheffield Plated Ware," carried on the artistic tradition and has gained wide popularity as a substitute for more costly sterling silverware.

Sheik (*shēk*), meaning the eldest, the title of the chief of an Arab tribe and of various dignitaries among the Mohammedans.

Shekel (*shĕk'l*), the Hebrew unit of weight and of money. The value of the silver shekel is usually stated to have been from 50 to 60 cents, while the golden shekel was of half this weight and valued at about $10.80. Both as money and as a weight the shekel was divided into the *beha, reba,* and *gerah,* valued at one-half, one-fourth, and one-twentieth of a shekel.

Shelby (*shĕl'bĭ*), ISAAC, pioneer and soldier, born in North Mountain, Md., Dec. 11, 1750; died at Traveler's Rest, Ky., July 18, 1826. His family early moved to Tennessee where his father engaged in the cattle business. Isaac gained military experience in border warfare with the Indians. He entered the Colonial Army at the beginning of the Revolution, distinguished himself in a fight with the Indians at the Battle of Long Island Flats, in Tennessee, in 1776, and in 1780 won new honors at the Battle of King's Mountain. Having settled in Kentucky territory in 1783, he served two terms as governor (1792-96, 1812-16). Shelby was awarded a medal by Congress for leading 4,000 Kentucky volunteers to the relief of Gen. Harrison in Canada, during the War of 1812, and for service at the Battle of the Thames.

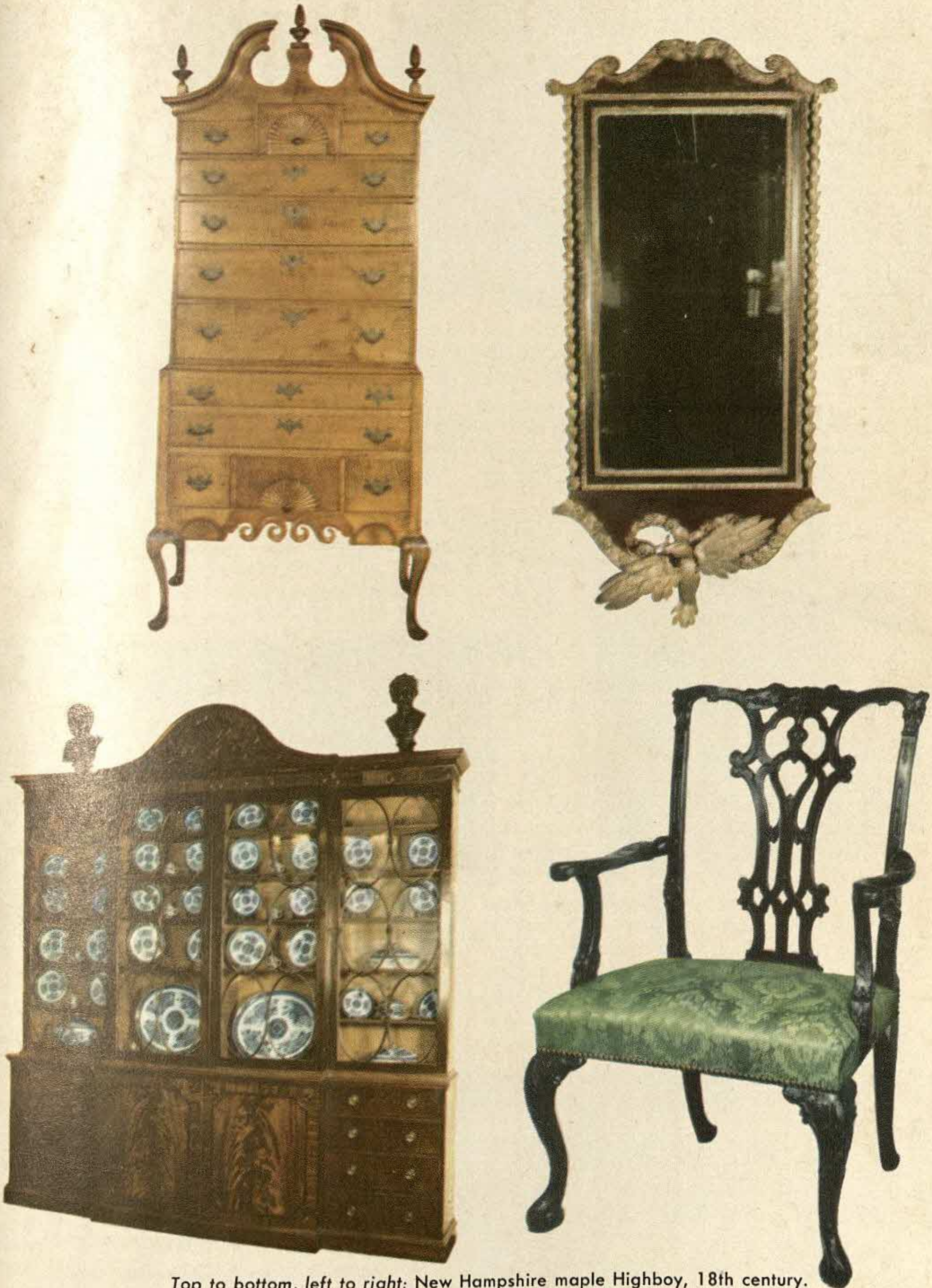
Shelbyville (*shĕl'bĭ-vĭl*), county seat of Shelby County, Ind., 27 m. S.E. of Indianapolis, at the convergence of the Big and Little Blue Rivers. It is on the Pennsylvania and the New York Central R.R.'s. Shelbyville is surrounded by a farming and dairying country that also has natural gas deposits. Manufactures include farm machinery, gas ranges, furniture, radios, and food and textile products. The town was incorporated in 1860. Population, 1950, 11,734.

Shelbyville, county seat of Bedford County, Tenn., about 50 m. S.E. of Nashville. Located in an agricultural area, it produces rubber and knit goods, pencils, stoves, lumber, textile and dairy products, and paper boxes. It was incorporated in 1819. Population, 1950, 9,456.

Sheldon (*shĕl'dŭn*), CHARLES MONROE, author and clergyman, born in Wellsville, N.Y., Feb. 26, 1857; died in Topeka, Kan., Feb. 24, 1946. His early life was spent on a farm in Dakota Territory, and he studied at Brown Univ. and Andover Theological Sem. After a few months in London as a social service worker, he returned to the U.S. (1886) and two years later became pastor of the Central Congregational Church at Topeka, Kan. He wrote and edited many religious books. The most famous was "In His Steps," written in 1896 to show what Jesus would do in the world of that day. Translated into many languages, its reported sales totaled more than 25,000,000 copies, but the author never received royalties, because of a defective copyright.

Sheldon, EDWARD BREWSTER, playwright, born in Chicago, Ill., Feb. 4, 1886; died in New York City, April 1, 1946. He was educated at Harvard Univ. His first play, "Salvation Nell," with Minnie Maddern Fiske in the title role, was produced in 1908. This began his productive career as a playwright which ended only when he became

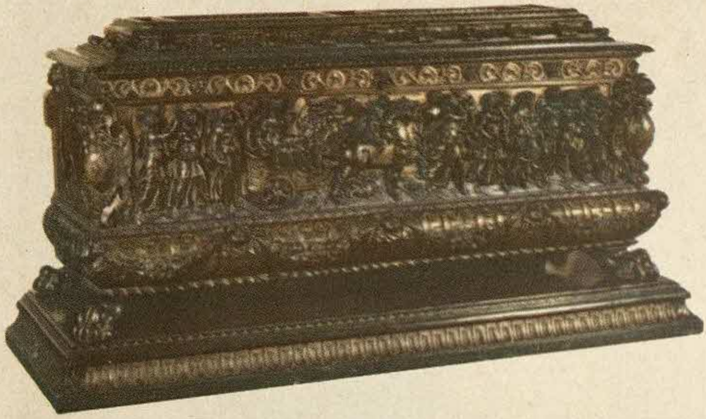
ENGLISH AND AMERICAN ANTIQUE FURNITURE

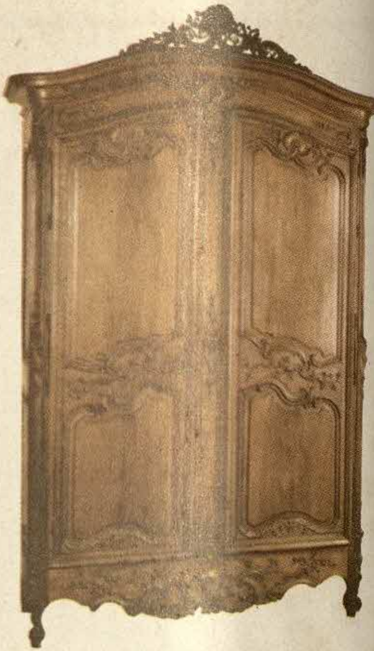


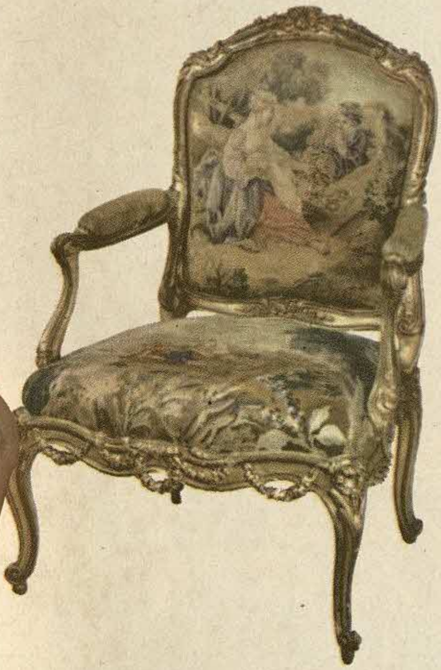
Top to bottom, left to right: New Hampshire maple Highboy, 18th century. American mahogany and gilded Mirror, early 19th century (From the collection of Francis Scott Key). English mahogany Adams Break-front Cabinet, 18th century. Carved mahogany Chippendale high-back master Arm Chair, 18th century.

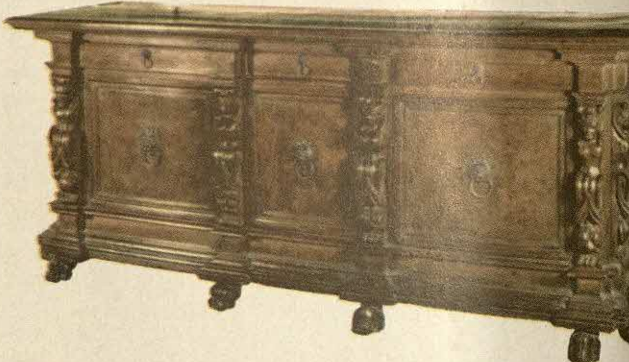
Courtesy French & Co., Inc., New York

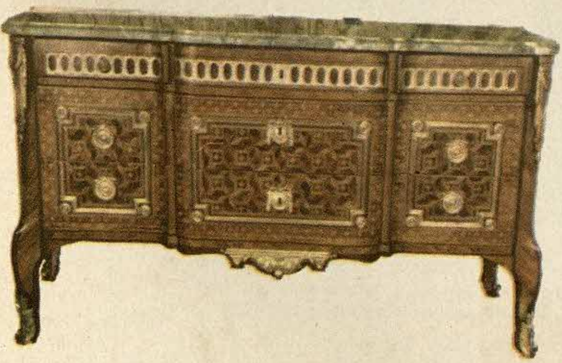
ITALIAN AND FRENCH ANTIQUE FURNITURE











Top to bottom, left to right: Florentine carved walnut and gilded Cassone, 16th century. French Provincial walnut Wardrobe, 18th century. Louis XV carved wood and gilded Arm Chair covered in 18th century royal Beauvais tapestry. Florentine carved walnut Credence, 16th century. French Commode with ormolu mounts and marble top, made by the cabinet maker, Louis Moreau, 18th century.

Courtesy French & Co., Inc., New York

blind in 1931 and partially paralyzed two years later. Although his plays were generally melodramatic and sensational, they were well contrived and many were extremely popular, often first as plays and later as motion pictures. They include "The Nigger" (1909), "The Boss" (1911), "The Princess Zim-Zim" (1911), "Egypt" (1912), "The High Road" (1912), "Romance" (1913) which later starred Greta Garbo in the movie version; "Song of Songs" (1914), "Bewitched" (with Sidney Howard, 1924), "Lulu Belle" (with Charles MacArthur, 1926), and "Jenny" (1929) and "Dishonored Lady" (1930), the last two with Margaret Ayer Barnes.

Sheldrake (*shĕl'drāk*), the common name of a class of ducks usually regarded as a connecting link between geese and ducks. They are native to the Eastern Hemisphere. The head and neck are dark glossy-green with a white collar beneath, and under this a chestnut color that extends over the upper part of the back. The rest of the plumage is white with black and greenish markings. They frequent sandy coasts, breeding in a burrow, often that of the rabbit. They lay about 12 to 14 eggs, which are nutritious food. The sexes are alike in plumage, but the male is somewhat the larger. These ducks, though quite shy, are capable of being domesticated. They are hunted for their eggs and down. Besides the *common sheldrake,* there are the *ruddy sheldrake* of Barbary and the *chestnut sheldrake* of Australia. An allied species common to the U.S. is sometimes called sheldrake, but it is more properly a *red merganser.*

Shell (*shĕl*), the hard covering of many invertebrate animals. A shell serves to encase the soft and vulnerable bodies of certain invertebrates, or to cover parts of them. The term is also applied to the envelope of a nut, and an egg. Many classes of shells occur in the animal kingdom, varying in size from minute microscopic organisms to large formations weighing 500 lbs. All shells possess a more or less distinct organic structure, which in some animals resembles true skin, while in others it is quite like the epidermis of the higher animals. The shells of many groups of mollusks differ so materially that it is often possible to determine the family, and in some cases even the species, by examining small fragments of their shells, this being true both in fossil and recent specimens. Shell composition consists usually of calcium carbonate and albumen, and the formation gradually thickens through the addition of successive layers as the animal grows from infancy to its full maturity. See also *Mollusca.*

Shells are known as porcelain or pearly, according to their constituency. Those having more lime than albumen form the hard *porcelain shells,* while those having consecutive layers of albumen and lime constitute *pearly shells,* so called from their resemblance to mother-of-pearl. As to form, the two classes consist of the univalve and bivalve shells. *Univalves* are those which have only one part, such as the shells of snails; *bivalves* are formed of two parts joined together by a hinge, like the shells of the clam and oyster. Many forms are included in both classes, but bivalves are largely pearly shells and univalves are mostly porcelain. Shells have been classified in the same manner in which animals are biologically classified. In most cases the name of each classification is the name of the man discovering that group. The names of some of the authors of the various shell species are abbreviated as follows:

Bern. = Bernardi
Chemn. = Chemnitz
Daut. & Fisch. = Dautzenberg and P. H. Fischer
Kien. = Kiener
Lam. = Lamarck
Linne. = Linnaeus
Sol. = Solander
Sow. = Sowerby
Gmel. = Gmelin

Shells are useful for many purposes, such as the making of ornaments, buttons, and handles for edged tools. In some countries they are burned into lime, and used for fertilizing land. For illustrations in color, see *Volume VII.*

Shell, a hollow projectile filled with an explosive, toxic gas, smoke, or incendiary or illuminating substances. Solid projectiles such as the armor-piercing type are currently referred to as "shot." The forerunner of the modern explosive shell was a hollow exploding spherical shot reportedly used by the Venetians as early as 1376. Explosive shells later became the principal type of projectile (*q.v.*), for use in mortars. Early mortar shells did not have time or impact fuzes (*q.v.*) but were exploded by a fuse (*q.v.*) made of strands of fabric soaked in a mixture of strong wine and gunpowder. The propelling charge behind the shell was ignited through a touch hole. The crude fuses on the shells did not always burn at the same rate and there was always doubt as to which would explode first, the shell or the propelling charge. Despite their disadvantages, Henry VIII made use of 50 mortars during the siege of Boulogne (1544); the hollow shot were filled with "wild-fire."

Modern artillery weapons, mortars, and naval guns (*qq.v.*) fire shells filled with high explosives such as explosive D, Tetryl, TNT, etc. There are also many special-purpose chemical shells. Modern shells are equipped with fuzes designed to detonate the burster charge or explosive filler on impact, or with a delay after impact, or at a set time after the shell leaves the gun. The proximity fuze, details of which are still secret, was developed during World War II. This is an electronic fuze which functions on arriving within a certain distance from the target.

The term shell does not apply to small-arms projectiles which are .60 in. or smaller in diameter. See also *Explosives.*

Shellac (*shĕl′lăk*). See *Lac.*

Shelley (*shĕl′ĭ*), MARY WOLLSTONECRAFT (née Godwin), novelist, born in London, Aug. 30, 1797; died there, Feb. 21, 1851. A daughter of the philosopher William Godwin and his wife (the author, Mary Wollstonecraft), she eloped to Switzerland with Percy Bysshe Shelley in 1814; they were married in 1816 after the death of Shelley's wife. In addition to editing Shelley's poetic works, Mary Shelley is noted for her novel "Frankenstein" (1818), the story of a man-made monster which turned on its creator.

Shelley, PERCY BYSSHE, poet, born Aug. 4, 1792; drowned while sailing in Italian waters, July 8, 1822. Shelley came from a wealthy, titled English family which provided for him the education usual for his class and day, but Shelley did not take kindly to "usual" education. Throughout his life, indeed, Shelley was rebellious against established customs and authority. His rebelliousness began at Eton, where he resisted both the official discipline of the school and the customary "fagging." At Oxford, which he entered in 1810, he remained only five months before he was expelled for publishing an anonymous pamphlet entitled "The Necessity of Atheism" and for stubbornly refusing to answer questions about it or to acknowledge his authorship.

Shelley not only advocated the ideas of the "free-thinkers," but he also lived by them. In 1811 he eloped with Harriet Westbrook, a young girl whom he had converted to atheism and whom he encouraged in resistance to her father's authority. In 1814, he fell in love with Mary Wollstonecraft Godwin, the 17-year-old daughter of Mary Wollstonecraft and William Godwin, a philosopher, whose revolutionary writings and conversation had strongly influenced Shelley. Shelley left his wife and eloped with Mary Godwin. In spite of their disbelief in the institution of marriage, Shelley and Mary Godwin married each other soon after the suicide of Harriet Westbrook Shelley in 1816.

Although it was not his first poem, Shelley's first important poetical work was "Alastor," written in 1815 after his separation from Harriet and his union with Mary Godwin. His most important works, written later, are perhaps "The Revolt of Islam," "The Cenci," and (by far his greatest poem) "Prometheus Unbound." Although he was by no means a systematic philosopher, almost all of Shelley's best work has moral and philosophic implications. His great poems assert universal love to be the only basis for true morality and ultimate justice. He also preached a doctrine of endurance.

PERCY BYSSHE SHELLEY

Some of Shelley's odes (*e.g.*, "To the West Wind," "The Cloud," "To a Skylark") are rivaled in English lyric poetry perhaps only by the great odes of Keats; his "Adonais," a lament for the death of Keats, is surpassed in its kind only by Milton's "Lycidas"; his many songs are among the best in English; and his prose essay, "The Defence of Poetry," is frequently compared with Sir Philip Sidney's "Apology for Poetry." Although enthusiasts for Shelley are sometimes extravagant in their praise of him at the expense of other poets, he deserves his high place in English literature.

Shellfish (*shĕl′fĭsh*), popular term for crabs, lobsters, oysters, clams, and mollusks.

Shell-Mound (OR KITCHEN MIDDEN) **Civilization** (*shĕl′mound sĭv-ĭl-ĭ-zā′shŭn*), in prehistory, a phase of the Late Paleolithic or Early Mesolithic Period (*q.v.*). See *Kitchen-Midden.*

Shell Shock (*shĕl shŏk*), in psychiatry, mental confusion or state of continuous fear. Partial or total paralysis, tremor, etc., may occur. This term was in common use during and after World War I when the condition was believed to be the psychological result of shell explosions in battle. Psychiatrists today believe that the condition is the result of emotional strain caused by warfare, and the term has now become superseded by more specific names for the various neuroses caused by combat conditions.

Shelter Belt (*shĕl′tẽr bĕlt*), a project designed to prevent, by planting timber, the droughts and dust storms in the farming sections of the Northwest, extending from the Canadian border through North Dakota to the Panhandle of Texas. See *Agriculture; Conservation.*

Shem (*shĕm*), in the Old Testament, the eldest son of Noah (Genesis 5:32), born when the latter was 500 years of age. Shem is the ancestor of the Semites.

Shenandoah (*shĕn-ạn-dō′ạ*), a river in Virginia and West Virginia, rising by two forks in Augusta County, Virginia. The river's North Fork has a length of 100 m., the South Fork, 95 m.; they join and flow 55 m. to the northeast to join the Potomac River at Harpers Ferry, W. Va. The farming area in the Shenandoah Valley is one of Virginia's richest. Many notable events occurred in the valley of the Shenandoah during the Civil War.

Shenandoah, a town in east central Pennsylvania, 18 m. N. of Hazleton, with freight service provided by the Lehigh Valley R.R. Hazleton Airport is 14 m. N. of the city. Shenandoah is a business and commercial town in an important anthracite coal district; the world's largest coal-cleaning plant is located here. It was settled in 1850 and incorporated in 1875. Population, 1950, 15,704; in 1960, 11,073.

Shensi (*shĕn-sē'*), a province of north central China, bounded east by Shansi and Honan, north by Suiyuan, west by Kansu, and south by Szechwan and Hupeh. Area, 72,334 sq. m.; capital, Changnan (Sian), one of the chief cities of the Chinese Empire until the 12th century A.D. Principal river, the Hwang-Ho, which forms the eastern boundary of the province. The rich loess soil of the Wei and Han Valleys grows cotton, rice, peas, maize, millet, barley, and fruit. Wheat is the chief crop. Coal and oil are found. Through this province passed the historic trade routes between Central Asia and China, and a part of the Great Wall of China crosses the northern sector of the province. Population, *ca.* 10,000,000.

Sheol (*shē'ōl*), in the Old Testament, the underworld, hell, into which Korah and his followers were sent (Numbers 16:30) after rebelling against Moses. In the New Testament, "abyss" corresponds to sheol. See *Hades.*

Shepard (*shĕp'ẽrd*), ALAN BARTLETT, JR., naval officer, first U.S. voyager into space, born in East Derry, N.H., Nov. 18, 1923. He was graduated from the Naval Acad. (1944) and served on a destroyer during World War II. He then entered the naval air arm and as a test pilot flew 3,600 hr. in high-altitude research. On May 5, 1961, he was rocketed from Cape Canaveral, Fla., on a 15-min., 22-sec. flight, 302 m. out to sea, in the 4,040-lb. space capsule *Freedom 7.* He reached a maximum speed of 5,180 m.p.h. and an altitude of 116 m. See also *Astronautics; Grissom, Virgil Ivan.*

Shepard, HELEN MILLER GOULD. See *Gould, Helen Miller.*

Shepherd Dog (*shĕp'ẽrd dôg*), a breed of dogs, usually classed with the wolf species. The size is medium, the tail is long and bushy, and the muzzle is quite sharp. Dogs of this breed are noted for their bright eyes and high grade of intelligence. They may be trained to watch and drive flocks and herds without being accompanied by the master. Dogs of this class are used extensively to tend sheep in mountainous countries, and are popular as farm dogs to drive cattle. The *Scotch collie* is a celebrated species of this breed.

Shepherd's Purse (*shĕp'ẽrdz pûrs*), a widely distributed weed of the Temperate Zones, where it flourishes in abundance along roadsides and in fields and pastures. The plant is an annual, has simple leaves and small white flowers, and bears its seed in a pod resembling a purse, hence its name.

Sheraton (*shĕr'ȧ-tŭn*), THOMAS, furniture designer and cabinet-maker, born at Stockton-on-Tees, England, in 1751; died in 1806. Next to Chippendale, Sheraton is considered the most famous English designer. Like several other great Georgian designers who lived and worked in London, he gave part of his attention to writing books for the trade: "The Cabinet-Maker and Upholsterer's Drawing Book" (1791); "The Cabinet Dictionary" (1802); and "The Cabinet Maker, Upholsterer and General Artists' Encyclopedia" (1804). A skilled draftsman, as well as a cabinet-maker, he made exquisite engravings to illustrate these books. Despite a degree of unevenness in his work, especially toward the end, his better designs are masterpieces of lightness and grace in construction. Distinguished by slender forms and sweeping curves, as well as by the use of satinwood and other exotic woods, authentic Sheraton pieces are highly valued by collectors of antique furniture, and reproductions of his designs are popular.

Sherbrooke (*shẽr'brŏŏk*), Quebec, capital of Sherbrooke County, Quebec, 80 m. E. of Montreal, at the confluence of the Magog and St. Francis Rivers. It is on the Canadian Pacific, the Canadian National, the Quebec Central, and the Boston & Maine Rys. It has diversified manufactures, and there are mineral deposits in the vicinity. A large proportion of the population is French-Canadian. Population, 1956, 58,523.

Sheridan (*shĕr'ĭ-d'n*), a city in northern Wyoming, seat of Sheridan County, 138 m. N.W. of Billings, Mont., on the Yellowstone River. It is served by the Great Northern and other railroads and is a gateway to Yellowstone National Park. The city is within a resort area; and the raising of livestock is an important industry. Settled in 1882, it was incorporated in 1885. Population, 1960, 11,651.

Sheridan, PHILIP HENRY, American general, born in Albany, N.Y., Mar. 6, 1831; died at Nonquitt, Mass., Aug. 5, 1888. His parents, who had migrated from Ireland shortly before Philip's birth, moved a year later to Ohio. Having finished his public school education, the boy obtained an appointment to West Point and was graduated in 1853. He gained fighting experience from frontier Indian warfare, and shortly after the outbreak of the Civil War was promoted from first lieutenant in the Union Army to captain. By the spring of 1862, he had been made colonel of the 2nd Michigan Cavalry, and the following July was promoted to the rank of brigadier general of volunteers. He continued to display such remarkable ability in the field—under Buell at Perryville, and

Rosecrans at Stone River—that before the end of the year he won another promotion to major general of volunteers. In the summer of 1863, he gave brilliant support to Rosecrans in maneuvering the Confederates under Bragg out of middle Tennessee, then helped cover the retreat after Rosecrans was finally defeated at Chickamauga (Sept. 20) and driven back to Chattanooga. It was in subsequent fighting around Chattanooga that Sheridan attracted the attention of Gen. Grant by his brilliant and daring charge up Military Ridge on Nov. 25. When Grant assumed command of the Army of the Potomac in Virginia (March 1864), Sheridan was placed in charge of his cavalry.

Sheridan and his men soon became famous for the daring of their raids into enemy territory, and for the ruthlessness with which they cut communications by destroying railroads and telegraph wires. Following notable successes in the Battles of the Wilderness and Spottsylvania Courthouse (May 5-21), Sheridan was given command of the newly formed Army of the Shenandoah (Aug. 7, 1864), with instructions to clear the enemy out of the valley. He made the most of this opportunity by a brilliant campaign in which he defeated Confederate General Early, first at Winchester (Sept. 19), then at Fisher's Hill (Sept. 22). Following a series of crippling raids into enemy territory, Sheridan was made a brigadier general in the regular army. Shortly afterward (Oct. 19) came the historic ride which brought him another promotion—to major general this time. The main body of his army had been thrown into confusion when Gen. Early launched a surprise attack at Cedar Creek. Sheridan, on his way back from Washington, heard the noise of battle 20 miles away, at Winchester, and rode madly to meet his routed forces. Waving his hat, he shouted: "Face the other way, boys. We are going back!" And go back they did—to victory and fame. Having joined Grant's Army of the Potomac in 1865, Sheridan assisted in the operations before Petersburg, defeating Gen. Early at Waynesboro in March. It was Sheridan who turned Gen. Lee's flank at Five Forks, thus forcing the Confederate retreat toward Appomattox which resulted in Lee's surrender to Grant on April 9, 1865.

Having filled various posts after the war, Sheridan was given chief command of the U.S. Army in 1883, and the rank of general five years later. During the Franco-German war of 1870, he witnessed the leading battles and maneuvers of the German Army, as guest of the king of Prussia. His "Personal Memoirs" were published after his death.

Sheridan, RICHARD BRINSLEY BUTLER, dramatist and statesman, born in Dublin, Ireland, Oct. 30, 1751; died July 7, 1816. The son of an actor father and a novelist mother, young Sheridan went to Harrow for six years (1762-68) and later collaborated with one of his schoolmates, N.B. Halhed, in preparing a metrical translation of Aristaenetus, a Greek man of letters who lived in the 5th or 6th century A.D., and in writing the farce, "Jupiter."

RICHARD B. SHERIDAN

In 1772, Sheridan secretly married Elizabeth Ann Linley, the daughter of composer Thomas Linley. As both families highly disapproved of the match, Elizabeth was brought home and Sheridan was rushed off to Waltham Abbey to continue his law studies. Shortly after he was entered at the Middle Temple; in the following year, however, he again married Elizabeth Ann, this time in a public ceremony. At that time Sheridan was far more interested in literary studies than in law, and he continued his writing. On Jan. 17, 1775, his first comedy, "The Rivals," was produced with great success at the Covent Garden Theater. In the same year he wrote a farce, "St. Patrick's Day, or the Scheming Lieutenant," and collaborated with Thomas Linley to produce a comic opera, "The Duenna."

Between 1776 and 1778, Sheridan, in partnership with Linley and Dr. Ford, purchased the Drury Lane Theater. Sheridan became manager of the theater and soon produced "A Trip to Scarborough," which he had purged and adapted from Vanbrugh's "Relapse." Sheridan's famous comedy, "The School for Scandal," was produced in 1777. It is said that the play almost failed to be licensed by the lord chamberlain because of certain suggestive elements in its plot. It was, nevertheless, exceptionally well received and ran for a number of years. Generally considered Sheridan's best work and a masterpiece of satirical comedy, this play presented a graceful and sparkling picture of contemporary society and its petty shortcomings. "The Critic," produced in 1779, poked fun at the absurd and amusing foibles of theater people, playwrights, actors, and the general public. Sheridan's last play, a tragedy, "Pizarro," was performed in 1799.

In 1780, Sheridan entered parliament as a member for Stafford. He was opposed to the war in America, declining an offer of £20,000 for his services from the U.S. Congress; he disapproved of English intervention in the French revolution, but when Napoleon became an increasingly dangerous enemy to England, he advocated war; and he opposed a union of the English and Irish parliaments.

Sheridan became undersecretary of state for foreign affairs in the Rockingham Whig ministry (1782) and secretary of the treasury under the Duke of Portland (1783). In 1806, when the Whigs came into power, Sheridan was appointed treasurer of the navy and a member of the privy council. When he was not returned in the general election of 1807, however, he deserted the Whigs and thereafter occupied a more or less independent position in the parliament. He became a great personal friend of the Prince of Wales and at the latter's expense was later elected a member for Ilchester when he failed to be returned from Westminster in 1807. In 1811, Sheridan was partly responsible for excluding the Whigs from power. His parliamentary career ended in 1812 as he was not returned for Stafford.

Sheridan's last years were not happy ones, for in addition to the disappointments in his public life he was submerged in personal debts. The Drury Lane Theater, which was his only source of income, never provided enough to cover the expenses of his fashionable life, and it was destroyed by fire on two occasions, the second in 1809. He was arrested for debt in August 1813 and died in impoverished circumstances. He was buried in Westminster Abbey.

Sheriff (*shĕr′ĭf*), the chief administrative officer of a county, in both Great Britain and the U.S. The duties relate to the execution of civil and criminal processes. They include the maintenance of peace and order and the attendance upon courts as administrative officer. In England sheriffs are usually appointed by the king, while in the U.S. they are popularly elected for varying terms. The sheriff is required to give a bond for the faithful performance of his duties. In the more populous counties he has one or more deputies, for whose official acts he is civilly liable. The sheriff originally exercised judicial authority in England and Scotland, where he presided over the common-law county court, and twice a year he made a circuit to the subdivisions of his shire, known as the *sheriff's tour.*

Sherman (*shĕr′mạn*), county seat of Grayson County, Texas, 65 m. N. of Dallas and 12 m. S. of the Red River. Communication is furnished by the Missouri, Kansas & Texas, the Texas & Pacific, the Atchison, Topeka & Santa Fe, and other railroads. It is surrounded by a rich cotton, grain, and livestock country. The manufactures include flour, cotton-seed oil, cordage, furniture, tobacco products, vehicles, ice, brooms, machinery, and farming implements. Sherman is the seat of Austin Coll. and Perrin Air Force Base which includes the U.S. Air Force Pilot School. It was settled *ca.* 1848, but did not develop until a stagecoach line came in 1857, and was incorporated in 1895. Population, 1950, 20,150.

Sherman, JAMES SCHOOLCRAFT, politician, born at Utica, N.Y., Oct. 24, 1855; died Oct. 30, 1912. He studied at Hamilton Coll., whence he was graduated in 1878, and two years later was admitted to the bar. After being mayor of Utica, he was elected to Congress, in 1886, in which he served continuously until 1909, except for the period from 1891 until 1893. He was elected Vice President of the U.S. in 1908, on the Republican ticket with William H. Taft.

Sherman, JOHN, lawyer and legislator, born in Lancaster, O., May 10, 1823; died Oct. 22, 1900. He was educated in public schools and later studied law at Mansfield in the office of his brother, C. T. Sherman. In 1854 he was elected to the U.S. House of Representatives on the Free Soil ticket, and was re-elected for two succeeding terms.

He was elected to the Senate in 1861, serving continuously in that body until March 1877, when he was appointed Secretary of the Treasury by President Hayes. He held this post till 1881. In the latter year he was again elected to the Senate, and was re-elected in 1887 and 1893. President McKinley appointed him Secretary of State in 1897, a position he held until April 1898, when he retired from public life.

Sherman's name is inseparably connected with the history of American finance and commerce. He was influential in the passage of the Sherman Act, providing for regular purchase of silver by the government, and the issuance of treasury notes based on this silver stock. His name will always be connected with early anti-trust legislation (see *Trusts*). He wrote "Recollections of 40 Years in the House, Senate, and Cabinet."

Sherman, ROGER, statesman and signer of the Declaration of Independence, born in Newton, Mass., Apr. 19, 1721; died in New Haven, Conn., July 23, 1793. He learned the trade of shoemaker while a boy and followed it as a business until 1743, when he entered a store at New Milford, Conn., and was chosen county surveyor in 1745. After studying law, he was admitted to the bar in 1754, and became a member of the legislature and later a judge of common pleas. In 1774 he was selected as a member of the Continental Congress, where he served on the committee to draft a declaration of independence, and subsequently aided in framing the Articles of Confederation and the Federal Constitution. He was elected to the Senate in 1791, but died two years later. Sherman also held other positions of importance, including 19 years of membership in the Connecticut legislature, 10 years of service as treasurer of Yale Univ. (1766-76), and 9 years in the office of mayor of New Haven (1784-93).

Sherman, WILLIAM TECUMSEH, American general, born in Lancaster, O., Feb. 8, 1820; died in New York City, Feb. 14, 1891. He was a brother of John Sherman, and on the death of his father, in 1829, was adopted by Thomas Ewing, who provided for his education in the Lancaster Acad. and afterward procured his appointment as cadet at West Point Military Acad. In 1840 he was graduated the sixth in rank of his class and secured an appointment to the artillery. He served against the Seminoles in Florida from 1840 to 1842, was stationed at Ft. Moultrie, S.C., until 1846, and subsequently served as adjutant general during the Mexican War. He married Ellen Boyle Ewing, daughter of Thomas Ewing, in 1850, and three years later resigned his commission in the army to become manager of a bank in San Francisco. Sherman, having begun the study of law in 1843, was ultimately admitted to the bar. In 1858 he began the practice of law in Leavenworth, Kan., but was made superintendent of the military academy at Alexandria, La., the following year. When that state seceded from the Union, he promptly resigned, and was appointed colonel in the U.S. Army with a command under Gen. McDowell.

Sherman had command of a brigade in the First Battle of Bull Run. He was soon made brigadier general and was assigned to the department of the Cumberland, of which he was given command on Oct. 8, 1861. Sherman was among the first to represent to the Secretary of War that it was necessary to secure 60,000 men for the defense of Kentucky and 200,000 to conduct successful operations against the enemy, but many held the view that the war would be of short duration, and characterized his judgment as unsound. Gen. Buell superseded him in November, and he was ordered to report to Gen. Halleck, under whom he received command of a camp of instruction near St. Louis. Later he formed a division for himself, and in the Battle of Shiloh, on Apr. 6, 1862, won favorable mention by Grant and Halleck for distinguished services. He was made major general of volunteers soon after, and exercised a large influence in the operations under Grant around Vicksburg and Memphis. The first attack on Vicksburg was made in December 1862, but Grant's supplies were captured at Holly Springs, thus giving the enemy time to reinforce the city, and Sherman found it impossible to assail that stronghold successfully with the inadequate force at his disposal. However, he was joined by Gen. McClernand in storming Arkansas Post, where they captured 7,000 prisoners, and in 1863 he bore the brunt of the battle at Chattanooga.

Courtesy Metropolitan Museum of Art, N. Y.

WILLIAM TECUMSEH SHERMAN

Bronze bust by Augustus Saint-Gaudens (1848-1907)

When Grant became commander-in-chief of the forces in March 1864, Sherman was put in command of the military division of the Mississippi and was ordered to advance upon Atlanta against Gen. Joseph E. Johnston. That stronghold was occupied on Sept. 1, but involved a month and a half of fighting, including the battles of Dalton, Resaca, New Hope Church, and Kenesaw Mt. Soon after he started upon his famous march to the sea with 70,000 men, and, after defeating the enemy at Ft. McAllister on Dec. 21, entered Savannah. A month later he started on his march northward through the Carolinas to support Gen. Grant, but, on hearing the news of the surrender of Gen. Lee, Gen. Johnston sent to Sherman for terms of peace, and surrendered at Durham's Station, N.C., on Apr. 26, 1865. Sherman was given command of the division of the Mississippi after the war. He was made lieutenant general in 1866, and President Grant, in 1869, raised him to the rank of general. He made a tour of Europe from 1871 to 1872, and was placed on the retired list on Feb. 8, 1884. Though given numerous opportunities to fill political offices, he constantly refused. He ranks among the most eminent military leaders of America, being characterized by promptness in execution and fearlessness in confronting danger, yet strengthened by remarkable soundness of judgment. He wrote "Personal Memoirs."

Sherriff (*shĕr′ĭf*), ROBERT CEDRIC, author, born at Kingston-on-Thames, England, June 6, 1896. A man of varied literary gifts, Sherriff has written plays, novels, and film adaptations. His most successful play was "Journey's End" (1929), based on his World War I experiences. Other plays are "Windfall" (1933) and "St. Helena" (with Jeanne de Casalis, 1935). His novels include "The Fortnight in September" (1931) and "Greengates" (1936) and his movie scenarios, "The Invisible Man" (1933), "Goodbye, Mr. Chips" (1936), "The Hamilton Woman" (1941), "Odd Man Out" (1945), and "Quartet" (1948).

Sherrington (*shĕr′ĭng-tŭn*), SIR CHARLES SCOTT, physiologist, born in London, England, Nov. 27, 1861; died in Eastbourne, March 4, 1952. Educated at Cambridge Univ., he taught physiology at the Univ. of Liverpool (1895-1913), the Royal Institution of Great Britain (1914-17), Oxford Univ. (until 1936), and the Univ. of Edinburgh (1936-38). He shared the Nobel Prize for physiology and medicine in 1932 with Edgar Douglas Adrian (*q.v.*) for their discoveries on the function of the neuron. Sherrington's books include "The Integrative Action of the Nervous System" (1906), "Man on His Nature" (1940), and "The Endeavor of Jean Fernel" (1946).

Sherry (*shĕr′ȳ*). See *Wine.*

Shertok (*shẽr-tŏk′*), MOSHE. See *Sharett, Moshe.*

Sherwood (*shẽr′wo͝od*), ROBERT EMMET, playwright, born in New Rochelle, N. Y., April 4, 1896; died in New York City, Nov. 14, 1955. He was educated at Harvard Univ. After a year as dramatic editor of *Vanity Fair,* he served as associate editor and editor of *Life,* then a magazine of humor, from 1920 to 1928. The rest of his life he devoted to the writing and producing of plays, except for a time during World War II, when he headed the overseas branch of the Office of War Information. He won the Pulitzer Prize for three plays, "Idiot's Delight" in 1936, "Abe Lincoln in Illinois" in 1939, and "There Shall Be No Night" in 1941. He was given the Pulitzer Prize for biography in 1949 for "Roosevelt and Hopkins," a compilation of the private papers of Harry Hopkins (*q.v.*).

Although Sherwood was noted for his wit and for the superb craftmanship of his comedies, the three Pulitzer Prize plays clearly indicate his basic concern with serious subjects. "Idiot's Delight" is an explicit antiwar play, and "Abe Lincoln in Illinois" deals with the ironic paradox that peace is attained only through struggle. "There Shall Be No Night" was written in 1940 as a call to war against Germany.

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ROBERT E. SHERWOOD

The humor and theatrical skill which mark his comedies reveal his sharp perception of the foibles and inconsistencies of human behavior. Among these plays are "The Road to Rome" (1927), "The Queen's Husband" (1928), "Waterloo Bridge" (1929), "This is New York" (1930), "Reunion in Vienna" (1931), "Acropolis" (1933), "The Petrified Forest" (1934), and "The Rugged Path" (1945). Sherwood also wrote one novel, "The Virtuous Knight" (1931), and collaborated in the writing of a musical play, "Miss Liberty" (1949).

Sherwood Forest (*shẽr′wo͝od fŏr′ĕst*), a hilly region in Nottinghamshire, England. Formerly covered with fine forests, the region, which is *ca.* 25 m. long and 7 m. wide, is now largely cleared and occupied by farms, gardens, and pastures. Sherwood Forest is associated in story and legend with Robin Hood (*q.v.*) and his men.

Shetland (*shĕt′lănd*), a group of several hundred islands and islets, situated *ca.* 55 m. N.E. of the Orkney Islands and forming a county of Scotland. The islands, which have a total area of *ca.* 550 sq. m., are rocky and only about 24 of them are inhabited, the main islands being Mainland, Yell, and Unst and the population totaling *ca.* 20,000. Winters are dry and extremely cold; summers are warm and moist. Lerwick, the principal town and seaport, has a population of *ca.* 5,000.

Fishing is the principal industry, but the raising of cattle, horses (principally Shetland ponies), sheep, and poultry is also important. Oats, turnips, hay, potatoes, and garden vegetables are raised, and woolen goods, fishing supplies, fish oil, and utensils are among the manufactures. The islands have deposits of peat, iron, and copper. Known to the Romans as *Ultima Thule,* or land farthest north, the Shetlands were long a possession of Scandinavia, and the people still speak a dialect largely mixed with Norse words.

Shibboleth (*shĭb′bō-lĕth*), a test word mentioned in Judges 12:6. It was used as a criterion by Jephthah and the Gileadites to test the Ephraimites after their victory over the latter. The Ephraimites were easily distinguished from the others because they could not pronounce the *sh* sound, and spoke the word as if it were spelled *sibboleth* instead.

Shields (*shēldz*), the urban aggregation of North and South Shields, two separate municipalities and important seaports, located in Northumberland and Durham, England, respectively. They are on opposite sides of the Tyne River, near its mouth at the North Sea.

North Shields, now incorporated into Tynemouth, extends about 1 m. along the river, is divided into an old and a new sector. Chief industrial establishments are shipbuilding yards, salt works, and iron foundries.

South Shields, originally a military post established by the Romans; its prosperity dates from 1489, when the first salt works were established there. Its manufactures include cordage, sailing vessels, anchors, earthenware, chemicals and glassware of various kinds. Pop., *ca.* 105,000.

Shiites (*shē'ĭts*). See *Islam.*

Shikoku (*shē-ḳō'ḳo͞o*), the smallest of the main islands of Japan, bounded on the E. by the Pacific Ocean and on the W. by Honshu and Kyushu Islands, from which it is separated by the Inland Sea. Area, 7,248 sq. m.; capital, Tokushima. A mountainous island with a maximum altitude of 7,355 ft., it contains copper mines, grows rice, and exports camphor and tea. Population, *ca.* 3,300,000.

Shillaber (*shĭl'a-bẽr*), BENJAMIN PENHALLOW, humorist, born in Portsmouth, N.H., July 12, 1814; died Nov. 25, 1890. He is best known for his "Life and Sayings of Mrs. Partington" (1854).

Shilling (*shĭl'ĭng*), a British silver coin. The shilling consists of 12 pence, or 1/20th of a pound sterling. A coin called the shilling, of varying values, had long been in use; but the silver shilling, with its value standardized at 12 pence, was first minted in 1504, in the reign of Henry VII. In colonial times in America the value also varied greatly; the long-favored (New) "York shilling" was worth 12½ cents. See also *Coin.*

Shiloh (*shī'lô*), an ancient town of Palestine, in the region occupied by the tribe of Ephraim. It was the sanctuary of the ark in the priesthood of Eli and Samuel, when it formed a religious center of influence. The Philistines destroyed it after the disastrous Battle of Ebenezer. Its site is thought to be that of the modern village of Seilun.

Shiloh, BATTLE OF, also called the Battle of Pittsburg Landing, the second great battle of the Civil War, fought on Apr. 6-7, 1862, so named from a church about 2 m. W. of Pittsburg Landing, on the Tennessee River. The Union army of about 38,000 men was commanded by Gen. Grant and the Confederate of about 40,000 by Gens. Johnston and Beauregard. The army of Gen. Grant, centered about Pittsburg Landing, was attacked on Apr. 6 by the Confederates. Union divisions under Gens. Sherman and McClernand were driven back with heavy losses. In the afternoon, however, Gen. Johnston was killed and the Confederates retreated. The next morning, Gen. Buell joined Grant with 7,000 men, and other reinforcements also came to hand. The Union army thereupon assumed the offensive and in the afternoon began to rout the Confederates and force their final retreat. Because of the even losses of about 10,000 men on each side, it was actually a victory for neither side.

Shin (*shĭn*), in anatomy, the frontal part of the leg, behind which is the *shin bone,* the larger of the two bones of the lower leg.

Shingles (*shĭng'g'lz*), HERPES ZOSTER, OR ZONA, an acute specific, infectious, and contagious disease of the nervous system caused by a filtrable virus similar to that which causes chicken pox (*q.v.*). The infection localizes at the junctions of the nerves of sensation with the spinal cord and brain. The condition is manifested by mild fever and malaise of three to five days' duration with sudden eruption of tiny, red, watery, itching blisters of the area or belt of skin supplied by the affected nerve or nerves—usually on the trunk, and occasionally on the face or scalp. The fever and blisters usually disappear in a few days, but neuralgialike pain may persist in the affected areas for some time. Treatment is symptomatic, including relief of irritation and pain. Recently deep X-ray therapy has been applied; occasionally the root of an affected nerve must be cut in order to relieve intractable pain.

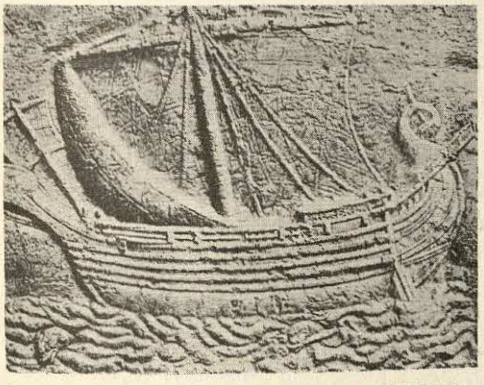
Shinnecock (*shĭn'ē-ḳŏḳ*), a remnant of the Algonquin Indian tribes of Long Island, now situated on a small state reservation of about 400 acres, on Shinnecock Bay, opposite Southampton. The survivors numbered 156 in 1940 and were much mixed with other races.

Shintoism (*shĭn'tō-ĭz'm*), one of the chief religions of Japan, formerly the official religion of that country. The word Shinto means, in rough translation, "The Way of the Gods." Apparently the word was not used until after the introduction of Buddhism from Korea in 552 A.D., although scholars believe that Shintoism had by that time been in existence for 500 or 600 years. By the 9th century Buddhism (*q.v.*) had far overshadowed Shintoism in Japan, and remained in the ascendant until 1868. In that year, as the culmination of the efforts of the scholars of the Tokugawa period (1603-1868), so-called Pure Shinto was established as the state religion. In 1882, a clear legal distinction was drawn between two kinds of Shintoism: Sectarian Shinto, an ordinary religion, and State Shinto, which had nationalistic and patriotic connotations. State Shinto was based on the belief that the Japanese emperor was directly descended from the sun goddess, Amaterasu-Omikami, and was therefore divine, and that the Japanese people, through their connection with the sun goddess and other gods, were superior to all other peoples and were therefore justified in imposing their will on inferior nations.

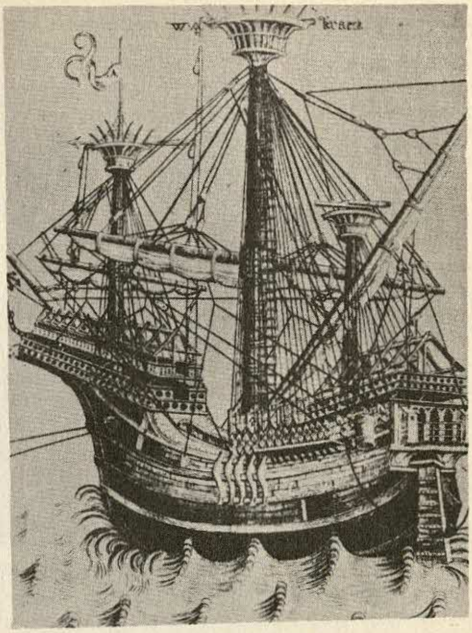
On Dec. 16, 1945, after the conclusion of World War II, Gen. Douglas MacArthur (*q.v.*) abolished Shintoism as a state religion.

His decree forbade the Japanese government to give that religion financial support, forbade the schools to teach it, and freed all Japanese from any compulsion to believe in it. On Jan. 1, 1946, in his New Year's Rescript, Emperor Hirohito publicly and officially disclaimed his own divinity. Sectarian Shinto was, however, permitted to continue as a religion and numbered approximately 17,000,000 followers in 1945, as against 45,000,000 Buddhists.

Shinwell (*shĭn'wĕll*), EMANUEL, public official, born Oct. 18, 1884, in London, England. Leaving school at the age of 11, he became a partisan of labor through his experiences as a worker on sailing vessels. He was twice elected president of the Glasgow Trades Council (1912 and 1916). He was imprisoned for five months during World War I for his part in a labor dispute. He then became a labor organizer, finally being elected to Parliament in 1922. He lost his seat in Commons in 1924, but was re-elected in 1928, this time serving as financial secretary of the War Office and as parliamentary secretary to the Department of Mines. In 1931, he refused to remain in Parliament, accusing Ramsay MacDonald of deserting the Labour Party. He later ran against MacDonald (1935) for Parliament, defeating the Prime Minister by 20,000 votes. In 1945, Shinwell was appointed Minister of Fuel and Power, and as such was responsible for the administration of the English coal mines (nationalized in 1947). In this position he had to contend with the British fuel crisis of 1947 which caused most of the country's industry to stop functioning. He was dropped from the Labour Government in 1947. He is the author of "The Britain I Want" (1943) and "When the Men Come Home" (1944).



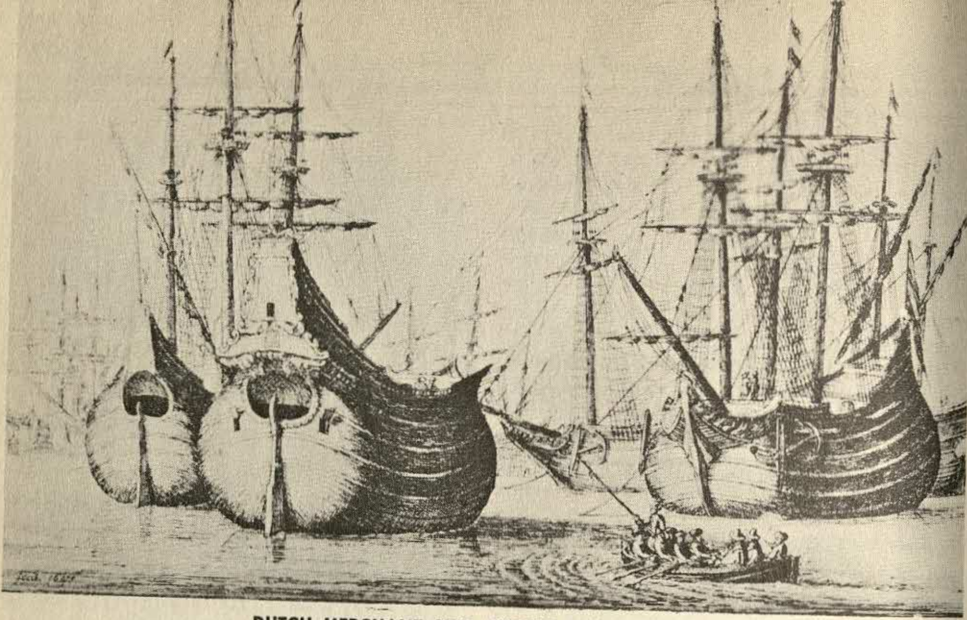
PHOENICIAN MERCHANT SHIP, 1st CENTURY B.C.



FLEMISH CARRACK, ABOUT 1470

Ship (*shĭp*), a vessel used for purposes of navigation, specifically one not propelled by oars, paddles, or the like. The principle of flotation by displacement, which is the basis of all navigation, was not at first comprehended, though the primitive hollowed-log boats testify to its application even in earliest times. The first known vessels included crude rafts, dug-outs made of hollowed tree trunks, canoes, etc., types which still exist today among the more primitive peoples. Archaeological research in the valley of the Nile has brought to light a boat believed to have been built in predynastic Egypt, about 10,000 B.C. This boat was made from a hollowed-out, one-piece log and is believed to have been driven by a small, square sail and to have been steered by an oar. Merchant vessels capable of carrying cattle and more than 50 persons were known to the Egyptians. The war galleys of this period were equipped with a projecting bow with a metal head, probably used as a ram.

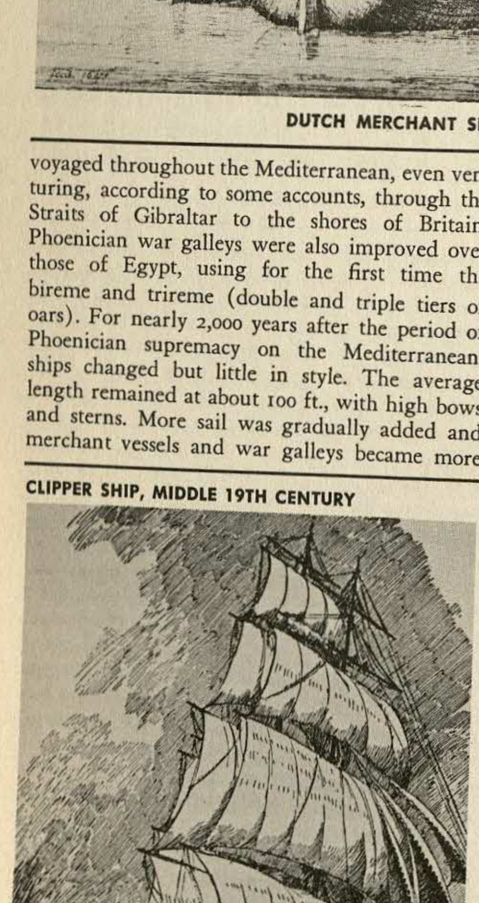
The first evidence of a Phoenician ship dates to *ca.* 700 B.C. The Phoenicians, essentially a trading people, constructed merchantmen superior to those of the Egyptians and capable of carrying larger cargoes. In these vessels, which were of a design and size suitable for deep-sea use, they



DUTCH MERCHANT SHIP, MIDDLE 17th CENTURY

voyaged throughout the Mediterranean, even venturing, according to some accounts, through the Straits of Gibraltar to the shores of Britain. Phoenician war galleys were also improved over those of Egypt, using for the first time the bireme and trireme (double and triple tiers of oars). For nearly 2,000 years after the period of Phoenician supremacy on the Mediterranean, ships changed but little in style. The average length remained at about 100 ft., with high bows and sterns. More sail was gradually added and merchant vessels and war galleys became more distinctive in type. Protective armor for the latter, such as leather or felt casing, was developed.

CLIPPER SHIP, MIDDLE 19TH CENTURY



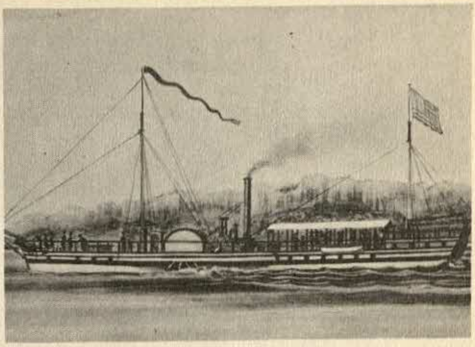
In a land farther north, the Vikings were meanwhile developing ships of their own, following essentially the same principles as their neighbors to the south. The Viking ships were more seaworthy, designed as they were to withstand rough northern seas and even ocean passage.

Medieval times saw a revival in shipbuilding, and vessels became larger. The necessity for arming merchantmen against pirates and enemy attack again merged war and merchant vessels. Most of the ships of this era were, therefore, armed merchantmen. The Venetians and Genoese brought the development of this type of ship to a peak of perfection.

With the dawn of the Renaissance came the sailing ship. (The sailing galleys of previous times had also been equipped with tiers of oars.) Now vessels came to be entirely propelled by sail, with only auxiliary oars. The era of exploration ushered in by the 15th century demanded sturdier ships. Improvements were also made in design. The length of the vessels remained under 200 ft., proportion of length to beam being about four to one. Merchant vessels and ships of the line, especially, were bluff in shape, with high sterns and bows. This design lent maneuverability in battle, or in narrow harbors, and made a heavy cargo and heavy armament possible, but speed was necessarily sacrificed. Not until the 19th century were any essential departures from this pattern made. In that century, the arming of merchantmen ceased with the disappearance of the pirate menace and the introduction of a century of comparative peace. It was in the U.S. in the late 18th century that the great advances in ship design were inaugurated. Speed had early been emphasized by American shipbuilders, the "Baltimore clippers" (distinct from the later, so-called "China clippers") being noted for great speed and fine lines. But these vessels also had limitations, their lightness excluding the possibility of a heavy cargo. In 1832 the first true clipper ship was constructed in Baltimore, fast, seaworthy, with yachtlike lines. Perfections in design followed, the clipper ships (used principally for trade with the East) becoming more extreme in the fineness of line and carrying more and more sail. Displacing generally under 500 tons, they rarely exceeded 200 ft. in length. The U.S. was at the zenith of its merchant-ship operation in the 1850's. The clipper ship declined in importance in the mid-19th century, as steam-propelled vessels began to become commonplace. The practice of equipping commercial sailing ships with auxiliary engines, introduced as early as 1845, is still maintained.

The introduction of steam engines and the switch from wood to iron for ship construction revolutionized the industry. Vessels began to be constructed of iron late in the 18th century (there is a record of an ironclad war vessel constructed by the Koreans in 1592), but the traditional example of this development is seen in the warships *Monitor* and *Merrimac,* which fought to a draw, during the American Civil War, in the first naval engagement between ironclad vessels. The first sizable iron ships built in the U.S. to engage in transatlantic trade were built for the American Steamship Line, by The William Cramp & Sons' Ship and Engine Building Co., in 1872 and 1873. These vessels were of only 3,100 registered tons and carried sails for auxiliary use. They were the largest merchant vessels built in the U.S. up to that date. By 1900, ships constructed of iron and steel had, to all intents and purposes, replaced wooden ships. The improvements of a single century had outweighed by far all developments of the previous 1,800 years.

Experiments in steam navigation were made as early as the 16th century, but lack of a suitable steam engine prevented any great advance. In the late 17th century James Watt filled this void, perfecting a steam engine capable of propelling a vessel if properly applied, and thus instituting an era of steamboat design. James Rumsey and John Fitch were the first to construct workable steamboats in America, Patrick Miller and William Symington in Scotland. Fitch developed a vessel, put into service in 1790, which plied the Delaware River on scheduled trips. It was not, however, a commercial success and was later overshadowed by the more highly publicized *Clermont* of Robert Fulton. The *Charlotte Dundas,* built in Scotland by William Symington in 1801, was a practicable vessel in all respects, but she had been built for canal service and the canal proprietors refused her passage for fear her wash would destroy the canal banks. Others who experimented successfully with the steamboat before Fulton were Nathan Reade, Oliver Evans, Samuel Morey, and Col. John Stevens. Robert Fulton, often erroneously credited with developing the first practicable steamboat, launched his famous *Clermont* on the Hudson River, Aug. 7, 1807. She made a successful trial run up the Hudson and thereafter made regular runs, becoming the first steamboat to be commercially successful. The practicability of steam-propelled vessels in sheltered waters was thus assured. In England, steam-propelled vessels were constructed to venture across the Channel, the Irish Sea, and into the North Sea. All were modeled on the old sailing vessels and all carried some auxiliary sail. The principal means of propulsion—remaining the most popular method of propulsion for half a century—was the side paddlewheel, temporarily eclipsing the screw propeller and jet propeller, although these were experimented with to some extent.



Courtesy Brown Bros., N. Y.

THE *CLERMONT,* LAUNCHED IN 1807

It was but a step now to an Atlantic crossing by steam. The *Savannah,* usually credited with being the first steam-propelled vessel to make the voyage (1819), was actually only a sailing packet equipped with auxiliary engines. She made the trip from Savannah, Ga., to Liverpool, England, in 25 days, spending all but 80 hr. under sail alone. Wood was used as fuel, and while operating by steam the speed was about 10 m.p.h. The fuel supply was limited; thus, much of the trip was necessarily made under sail. The Dutch steamer *Curaçao* could more correctly claim to be the first steam-propelled vessel to make the crossing. A wooden vessel, paddle-driven and with a registered tonnage of 438, the *Curaçao* crossed the Atlantic Ocean under steam in 1828, making the voyage in about a month. The possibility of ocean crossing by steamboat led to the establishment of regularly scheduled voyages and to the gradual development, not only of the traditional merchant service, but of an extensive passenger trade as well. Most of the well-known steamship companies had their start in this period, *e.g.,* Cunard, White Star, Red Star, etc.

The screw propeller, perfected by John Ericsson about 1830, now began to replace the paddlewheel as a means of propulsion. By 1860, its supremacy was established, at least for ocean navigation. The advantages of the screw propeller were especially important to warships, for all propelling machinery could be placed below the water line. In merchant vessels the screw minimized the importance of draft and depth of the cargo, which could be varied with no loss of efficiency. A demand for greater speed and for reduction of the proportional weight of the machinery to the horsepower resulted in the development of the tricompound or triple-expansion engine, a far lighter and more economical machine. Today, the steam turbine and internal-combustion engines are largely used. Diesel- and electric-powered vessels have also been introduced. Submarines operate on the surface by means of Diesel engines.

Save for the *Great Eastern* (*q.v.*), steamers of the 19th century did not exceed 600 ft. in length. In the early steamers, either speed or space was sacrificed, the two not then being compatible. This situation was not remedied until the 1920's and 1930's, when ships retaining both speed and large capacity began to be placed in service. The *Normandie,* the first ship more than 1,000 ft. in length, made her maiden voyage in 1935. She was followed by such vessels as the *United States* and the *America* under the U.S. flag, the *Queen Mary* and *Queen Elizabeth* under the British flag, and the *France,* under the French flag.

Hull improvements had kept step with machinery improvements. Iron had replaced wood in the construction of steamers and steel was now, in turn, to replace iron. A small steel vessel was placed in service in Burma in 1876, the first larger vessel of steel being a merchantman of 1,777 tons, constructed in 1879.

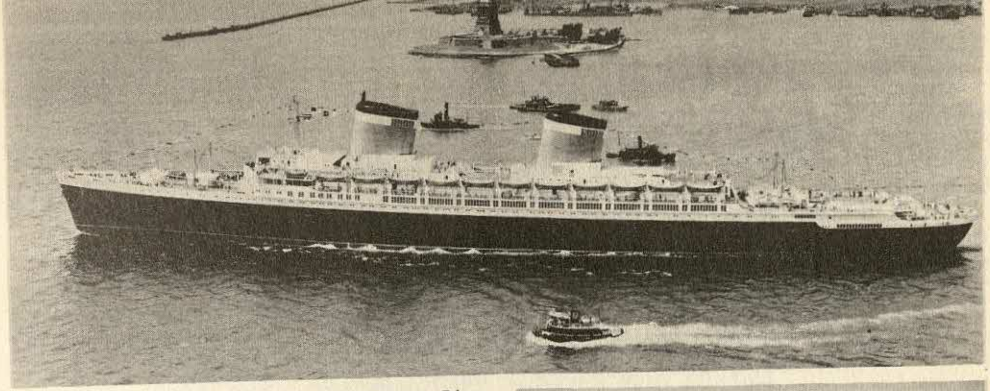
During the 1920's and 1930's, steamship companies vied with each other in building larger and faster ships. Vessels have become more and more specialized. Passenger liners were perfected, reaching the scope of "floating cities." Passenger-carrying freighters of the last century, now called cargo liners (tonnage *ca.* 10,000; speed, *ca.* 17 knots), greatly improved their passenger accommodations, and provided large storage facilities to make their runs economically sound. Ships of today fall into the following principal categories: *tankers,* equipped to carry oil in bulk, with a capacity of from 30,000 to 100,000 deadweight tons and traveling at speeds of from 14 to 19 knots; *merchantmen,* cargo vessels designed for service throughout the world, with a gross tonnage of 10,000 to 14,000 and traveling at speeds of 16 knots or more (see also *Merchant Marine*); *passenger liners,* developed particularly after World War I, with speeds of about 25 knots and gross tonnage averaging 45,000 (larger than these specifications and outstanding have been the *Normandie, Queen Mary,* and *Queen Elizabeth,* all displacing over 80,000 tons); *train ferries; steam trawlers; icebreakers,* etc. For vessels of war, see *Warship.* For record ocean crossings, see *Blue Ribbon of the Atlantic; Speed and Distance Records.* For illustrations in color, see *Merchant Vessels Through the Centuries,* Vol. XI.

Ship Fever (*shĭp fēv′ẽr*). See *Typhus.*

Shipworm (*shĭp′wûrm*), or TEREDO, the name of a wormlike mollusk, so called from its boring into the timbers of vessels below the water line. It is from 1 to 3 ft. long and the body is covered with a shell consisting of two valves. The shell is not large and covers only a part of the body, and in some species is reduced to mere appendages of the foot. These mollusks attack wood immersed in sea water, whether of ships or piers, and bore in the direction of the grain. They carefully avoid the tubes or openings made by their neighbors and swallow the dust of the rasped wood. Reproduction takes place through an ovoviviparous process, and the young attach themselves to the wood where they begin to bore at an early age. These mollusks are highly detrimental to piles, wharves, wooden ships, and fish traps.

Shiras (*shī′răs*), GEORGE, jurist, born in Pittsburgh, Pa., Jan. 26, 1832; died Aug. 2, 1924. He studied at Yale Univ., was graduated in 1853, and, after studying law in the Yale Law School, was admitted to the Pennsylvania bar. He practiced successfully in Pittsburgh, where he was associated with many important cases. He was appointed an Associate Justice of the U.S. Supreme Court by President Harrison in 1892, and was one of the judges who decided against the constitutionality of the income tax in 1894. In 1903, he retired from the bench.

Shiraz (*shē′răz*), capital of the province of Farsistan, Iran; 164 m. N.E. of Bushire. It occupies an elevated site 5,200 ft. above sea level and is surrounded by magnificent orchards, vineyards, cypress groves, and rose gardens. The city dates from 697 A.D., when it was founded as a resort for Persian princes, and through all the succeeding centuries its fame has been proclaimed in Persian poetry. A wall 4 m. long surrounds the city, enclosing many beautiful mosques, palaces, and institutions of learning. Shiraz has manufactures of wine, rosewater, cutlery, silk, cotton and woolen goods, firearms, glass, and earthenware. Tamerlane captured Shiraz in 1387. In 1812, 1824, and 1853 it suffered greatly from destructive earthquakes, with many people losing their lives. It claims to be the birthplace of Hafiz, Sibuyah, and



Courtesy United States Lines

S.S. *UNITED STATES*

Saadi. The tombs of Hafiz and Saadi are near it, and 35 m. N.E. are the ruins of the ancient city of Persepolis (*q.v.*), which was the capital of Persia under Xerxes and Darius. Alexander the Great destroyed Persepolis, but remains of the palaces may still be seen. Population, 1942, 129,000.

Shiré (*shē'rā*), a river in the southeastern part of Africa, the outlet of Lake Nyasa. It has a southerly course of *ca.* 370 m., entering the Zambezi *ca.* 90 m. above its mouth. The upper course is obstructed by many rapids and cataracts, where the fall is 1,200 ft. in a distance of 35 m., but the lower part is navigable for large vessels.

Shire (*shīr*), an Anglo-Saxon term formerly used to denote territorial divisions of England, Wales, and Scotland. Later "shire" was generally replaced by the Norman word "county," although certain geographical names such as York*shire* still exist. When "shire" is used as a suffix the pronunciation is *shĭr, shĕr,* or *shẽr.*

Shirer (*shī'rẽr*), WILLIAM LAWRENCE, journalist and radio commentator, born in Chicago, Ill., Feb. 23, 1904. After being a correspondent in Europe for the Chicago *Tribune* (1925-33), the Universal News Service (1935-37), and the Columbia Broadcasting System (1937-40), Shirer returned to the U.S., where he published a best-seller, "Berlin Diary" (1941), the first objective commentary on the development of the Hitler regime in Germany. He thereafter became a news analyst for the Columbia Broadcasting System, resigning in 1947. In the same year he became a commentator for the Mutual Broadcasting System. He has also published "End of a Berlin Diary" (1947), "Midcentury Journey" (1952), "The Rise and Fall of the Third Reich: A History of Nazi Germany" (1960), and novels.

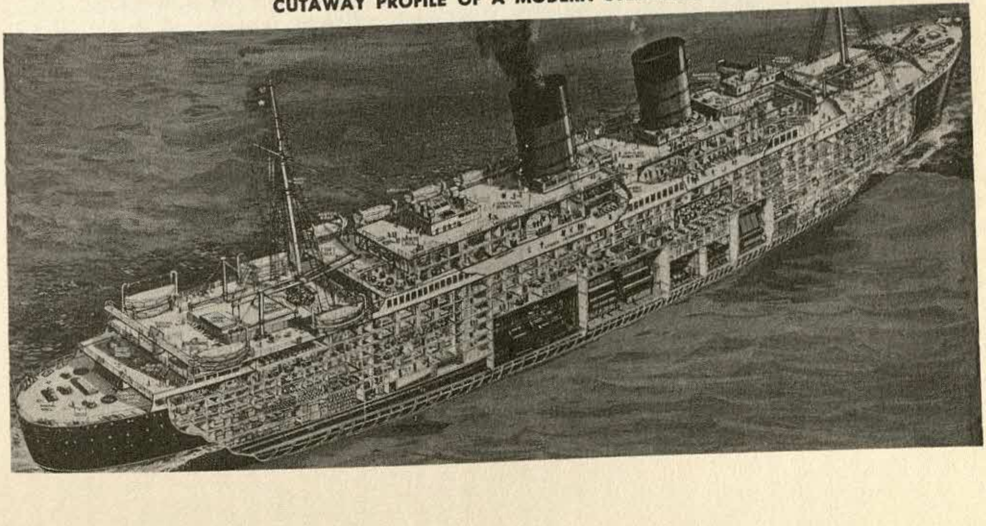
Courtesy Bethlehem Steel Co.

S.S. *MANHATTAN*, 1962

The largest tanker built in the U.S. thus far

Shirley (*shẽr'lĭ*), JAMES, dramatist, born in London, Sept. 13, 1596; died there, Oct. 29, 1666.

CUTAWAY PROFILE OF A MODERN STEAMSHIP



Educated at Oxford and Cambridge, he served as a minister of the Church of England, but soon embraced the Catholic faith and became master of St. Albans grammar school. A prolific playwright, he wrote many tragedies and comedies, up to the year 1642 when the Puritan edict made an end to his poetry. Among his tragedies are "The Traitor" and "The Cardinal"; among his comedies, "Hyde Park" and "The Ball"; and among his masques, "The Contention of Ajax and Ulysses." He is said to have died of exposure during the great London fire of 1666.

Shishak (*shī'shăk*), the name of a number of monarchs of Egypt, classed in the 22nd or Bubastite dynasty, thought to have been of Semitic descent. Shishak I is mentioned in the inscriptions placed on the portico of the great temple of Karnak by the Bubastite dynasty and on several statues to the goddess Pasht. When Solomon pursued Jeroboam, the latter fled to Shishak for protection. It is evident from monumental inscriptions that Shishak marched to Jerusalem against Rehoboam about 926 B.C., and after taking the city carried the treasures of the temple to Egypt. Scenes from this conquest of Jerusalem are recorded on the monuments of Karnak.

Shittim (*shĭt'ĭm*), the wood of the shittah tree, which is mentioned several times in Exodus and Deuteronomy. This wood was used principally in building the tabernacle and is identified with the *Acacia seyal* found in the vicinity of Sinai and the Dead Sea. It is hard, has a fine orange-brown color, and is not attacked by insects. The tree has small leaves and grows to a height of 20 ft.

Shiva (*shē'vȧ*). See *Siva.*

Shock (*shŏk*), in medicine. See *Psychiatry.*

Shoddy (*shŏd'ĭ*). See *Rag Trade.*

Shoes (*shōōz*), articles of wear for the feet; generally consisting of a stiff sole and a soft upper, shoes are made of leather and also of several other materials. The Egyptians, Greeks, and other ancient peoples wore a rudimentary shoe, consisting mainly of a sole held on the feet by thongs. Any one of this class of footwear is known as a *sandal.* For centuries the Egyptians wove a kind of shoes with strips of papyrus, which they painted and ornamented with remarkable skill. It was customary to wear the sandal in Rome, but later coverings were provided for the whole foot. Subsequently the Roman footwear was made more durable for army service by protecting the soles with nails and metallic plates. Both the ancient sandal style and the early American Indian *moccasin* have been revived for modern dress, sport, and beach wear. Later shoe styles rarely combined comfort with style, especially in the case of women's foot coverings. High spindle heels, pointed narrow toes, heavy buckles, high button tops or laced uppers characterized feminine footgear until the 20th century, when foot comfort and practicability were incorporated in the manufacture of stylish shoes.

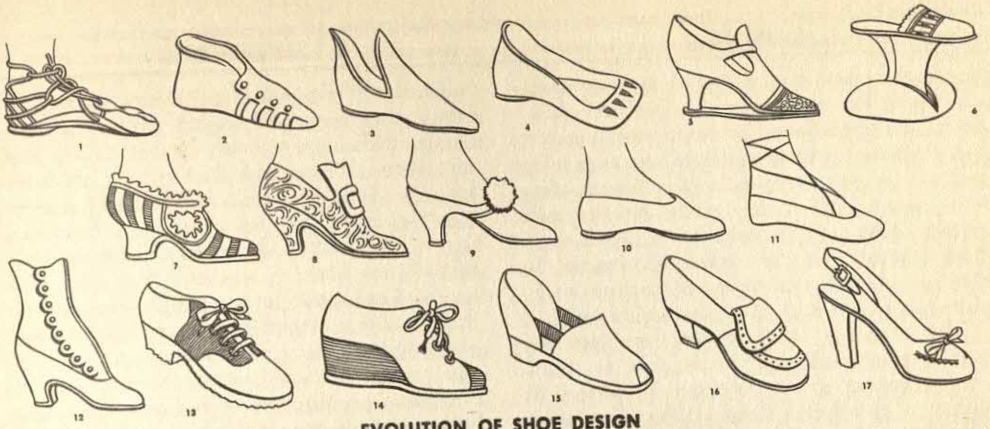
Shoe manufacturing, exclusively a hand process until about the middle of the 19th century, traces its roots in America back to 1629, to Thomas Beard, passenger on the *Mayflower's* third voyage to the American shores. Later, another shoemaker, Philip Kertland, began making shoes in Lynn, Mass. After 1850, various machines, such as the rolling machine, sewing machines, cable screw-wire machine, and others, transformed shoe-making from a hand craft into a large-scale industry. The majority of shoes produced at the present time are made by machines operated by skilled shoe workers. In shoemaking it is necessary to use several kinds of machines, some fitted to stitch the sole and others designed to sew the upper parts.

Boots are a modified form of shoes, having the upper leathers lengthened to form a protection for much of the leg, while *slippers* are a low form used largely for indoor wear. In Holland, France, and other countries of Europe shoes are made to some extent of wood; in Japan, of paper and plaited straw; and in many tropical countries, of plaited grass and hemp. It would be difficult to enumerate all the different kinds of shoes worn, since the art of dressing the feet for comfort, convenience, and fashion is quite as notional as the apparel for other parts of the body.

Other innovations in the industry, besides machines and mass production, have been numerous: the wide use of fabrics, such as gabardine, linen, etc., especially in the uppers of women's shoes; open-toed shoes; platform soles; wedged soles; backless shoes; discarding of buttons and high-laced shoes; introduction of the oxford for men in preference to higher-topped shoes; orthopedic shoes, designed by foot experts with the purpose of preventing and correcting foot deformities; composition soles, introduced during the shoe rationing program of World War II, constructed largely of reprocessed rubber with a certain amount of cotton fiber; and the use of plastics.

Shofar (*shō'fär*), Hebrew word for a ram's horn used in the synagogue in the Jewish service on Rosh Hashana (New Year) and Yom Kippur (Day of Atonement) according to the words of the Old Testament (Leviticus 23:24).

Shogun (*shō'gōōn*), a military title of Japan, first employed in the 1st century before the Christian era, when Emperor Suijin divided the empire into four divisions. The power of the four military rulers was gradually enlarged until 1603, when they became the ruling element in the country. However, the office of shogun was abolished after the revolution of 1868. In that year the em-



EVOLUTION OF SHOE DESIGN

1 Ancient Greek sandal; 2 early medieval; *3* and *4* Renaissance, *5* Italian, 16th cent.; *6* Chopine or high shoe, 16th cent.; *7* Dutch, 17th cent.; *8, 9, 10* French, 18th cent.; *11* ballet slipper; *12* through *17* 19th and 20th cent.

peror, or Mikado, was restored as the central power of the nation. See also *Japan*.

Sholokhov (*shô-lō'ḳôf*), MIKHAIL ALEKSANDROVITCH, author, born in 1905 in a small Cossack village on the Don River, Russia. Although his parents were very poor, he was sent to school in Moscow and Voronezh but while still in his teens returned to his native village to teach school. He began to write before he was 20, always of the peasants and of the life he knew in the little village where he lived. Of his many novels, only two have been translated into English: "The Silent Don," which appeared in two parts in the U.S., the first, "And Quiet Flows the Don" in 1934, the second, "The Don Flows Home to the Sea" in 1941; and "Seeds of Tomorrow," a novel concerned with collective farming, which was published in the U.S. in 1935. Sholokhov, whose work is immensely popular in Russia, was awarded the Stalin literary prize in 1941. After the beginning of World War II he became a war correspondent.

Shonts (*shŏnts*), THEODORE PERRY, businessman, born at Meadville, Pa., May 5, 1856; died Sept. 21, 1919. His parents moved to Iowa in the early sixties and settled at Centerville, where he attended the public schools. He studied at Monmouth (Illinois) Coll., being graduated in 1876, and the same year went into the banking business at Centerville. Subsequently he studied and practiced law, and in 1882 superintended the construction of the railway from Albia to Centerville. Later he was president of the Toledo & Western R.R. and a director of several banks and manufacturing enterprises. In 1905, President Theodore Roosevelt appointed him chairman of the Panama Canal Commission. He resigned in 1907 to become president of the Interborough Rapid Transit Co., New York City.

Shooting (*shōōt'ing*), the employment of portable firearms for military purposes or for sport. Shooting for sport is generally divided into two classes, field shooting or hunting, and target shooting.

The sport of target shooting (*q.v.*), provides varied and interesting competition, and in addition is an exercise of value in securing proficiency and accuracy in the use of firearms. Contests with the military rifle, with the small-bore rifle, with pistols and revolvers, and with the shotgun have been in vogue for many years, and several associations exist to promote the exercise both for sport and to secure the development of improvements in both guns and ammunition. Chief of these associations is the National Rifle Assn. of America (incorporated 1871), which maintains national headquarters in Washington, D.C. This association has been recognized by the government and holds regional and national rifle and pistol matches annually.

Shoran (*shō'răn*), an electronic device developed during World War II, which furnishes a means of making line-of-sight measurements with exceptional accuracy. The name is derived from "short-range navigation," since the object to which measurement is made must be in a line of sight as distinguished from those measurements which it is possible to make from reflected radio waves.

Originally designed to give precision position-location for bombing planes, the apparatus consists of two main units, an airborne transmitter and indicator, and two ground stations. The latter receive signals from the plane and repeat those signals which, when received on the plane's indicator, show the time elapsed for the round trip of the signals from the plane to each of the ground stations. The indicator consists of a cathode-ray (*q.v.*) oscilloscope (*q.v.*) which shows in a circular path a stationary loop marker caused by the outgoing signal and two other loops, one on the outside of the circle and the other on the inside, produced by the repeated signals from the ground stations. As the plane moves, the position of these two loops constantly changes unless the observer moves two dials to keep the loops adjacent to the marker. From the two dials the distances to the ground stations can be read in statute miles at any instant. Since there is an inherent lag in the circuits which would require a correction to be made to the readings, this correction can be determined and the dials set backward the proper amount so that the dials always give the correct distances.

The system is based on the fact that radio waves travel through space at close to 186,000 m. per second. It was developed by Stewart W. Seeley of the Radio Corp. of America for the U.S. Signal Corps. Its use by the Coast and Geodetic Survey is a practical application to the needs of hydrographic surveying and charting of the ocean bottom along our coasts for the protection and benefit of marine navigation. Connections to the shoran distance between elevated shore stations and the survey ship fix the position of the latter at each sounding or depth measurement. The accuracy obtained excels that of other electronic methods and permits the running of lines of hydrographic surveys as close as may be required to delineate bottom profiles for the cartographer. The equipment has been successfully used in Aleutian waters where fog, rain, and darkness would prevent the operation of these surveys for long periods of time. Shoran measurements have been made experimentally for the determination of distances between two shore stations up to 500 or 600 m. with geodetic accuracy. The process followed was to obtain shoran readings during the flight of an airplane at high altitude normal to the line between two ground stations. The minimum sum of the distances to these stations from the plane furnished side measurements for a scheme of triangulation network.

With proved tests of accurate bombing and geodetic surveying, it can be expected that in the near future shoran will be used for other types of measurements of distances and control of surveys. See also *Radar*.

Short (*shôrt*), WALTER CAMPBELL, retired U.S. Army officer, born Mar. 30, 1880, in Fillmore, Ill. The son of a physician, Short attended the Univ. of Illinois, entering the army as a second lieutenant upon his graduation in 1901. During the next 16 years he served in the U.S., Alaska and the Philippines. With the outbreak of World War I he was made a member of the General Staff training corps, continuing to serve in that capacity until 1940. At that time, he was given the rank of major general and sent to Columbia, S.C., to build up the first corps. Four months later, on Feb. 8, 1941, he assumed command of the Hawaiian defenses, with the temporary rank of lieutenant general. Following the Japanese attack on Pearl Harbor (*q.v.*) Short was recalled to Washington pending an investigation of the attack. A commission headed by Associate Justice Owen Roberts reported, in 1942, that its findings showed Short and the chief of naval personnel at Pearl Harbor, Adm. Husband Kimmel (*q.v.*), guilty of "dereliction of duty." These findings were substantially reaffirmed by an army investigating board in 1944 and by the Pearl Harbor Congressional Investigating Committee in 1946. The latter report also stated that the blame was wholly neither upon Short nor Kimmel, but also upon the War Plans Division which failed to co-ordinate Pearl Harbor defenses. Short voluntarily retired in 1942 and joined the Ford Motor Co. as traffic manager in Dallas, Texas, where he died on Sept. 3, 1949.

Short Circuit (*shôrt sẽr'kĭt*), a passage of uncontrolled current between two electrical conductors at different potentials as a result of failure of insulation. Short circuits usually result accidentally from aging or abrasion of the insulation. Occasionally two bare conductors come in contact and produce a short circuit. The passage of the current in a short circuit frequently produces a considerable amount of heat and sparking, with consequent danger from fire. Fuses are employed in electrical circuits to prevent the flow of excessive currents during short circuits.

Shorthand (*shôrt'hănd*), any system of rapid, brief handwriting that reduces the number of muscular movements required to keep pace with speech. It differs from longhand in that characters consisting of light and shaded strokes, curves and hooks, written upon, above, through or below the line, are used to represent words, parts of words, or sounds, instead of all the elementary sounds of words spelled out in longhand. The art is of great antiquity, having been employed by the ancient Greeks and Romans, to secure both brevity and secrecy, but nearly all traces of ancient systems were lost in the Middle Ages. Such specimens as have come to light indicate that the ancient systems were purely arbitrary in nature, incapable of being written at anything like the speed of speech, and of doubtful accuracy. At present there are two basic systems in general use, Pitman and Gregg. Pitman employs light and heavy strokes, circles, curves, and hooks, placed above, upon, through, or below the line. Gregg shorthand is written upon the line, flows along naturally, and is nonshading in character.

Timothy Bright published the first modern system of shorthand, which he called "Characterie," in 1588, which made use of arbitrary signs and symbols, instead of letters of the alphabet. The next system of note, published in 1590 by Peter Bales, was in essence a further development of Bright's ideas. These two systems of arbitrary characters and symbols were gradually improved upon and refined during the next two centuries by John Willis (1602), Edmund Willis (1618), Thomas Shelton (1641), this latter being the system employed by the English writer Samuel Pepys in his famous "Diary," Jeremiah Rich (1654), William Mason (1672), Thomas Gurney (1752), John Byrom (1767), and Samuel Taylor (1786).

However, it was not until 1837 when Isaac Pitman published his first work on shorthand, which he then termed "Stenographic Sound Hand," and later "Phonography," in a revised edition of 1840, that the art achieved a really scientific basis and for the first time produced a medium which was capable of translating words used in rapid speech into truly phonetic symbols based upon the sounds used in speaking the English language. Pitman shorthand rapidly superseded nearly all other systems and was adapted for use in many foreign languages, among them the German, Dutch, French, Italian, Japanese, Spanish, and many others. Pitman used 41 letters to represent the elementary sounds, six long and six short vowels, five diphthongs, and 24 consonants. Double and treble consonants for abbreviating the writing were made by hooks and circles at the beginning and end of the consonant strokes. This system rapidly revolutionized shorthand writing, being well adapted to secure legibility as well as the greatest degree of brevity. Since its publication many other systems have either been modified from Pitman's or originated independently, but the Pitman system is still widely used.

In 1888, John R. Gregg published "Light Line Phonography," which has now become the well-known Gregg Shorthand system and is widely used throughout America and nearly every country in the world. The basic difference between Gregg and Pitman lies in the fact that the former employs curved and non-shaded outlines which are written on the line, and, unlike Pitman shorthand, is not geometric or angular in outline. These are the two major systems presently in use wherever shorthand is written.

Stenotypy, or machine-written shorthand, has come into vogue in the U.S. within the past 30 years. This system is making rapid strides toward a place alongside Pitman and Gregg shorthand in the field of popular reporting mediums. Like shorthand, it is entirely phonetic in character, but uses letters of the English alphabet to represent sounds, words, and phrases instead of symbols and shorthand characters. The stenotype machine employs 12 consonant and four vowel keys, but duplicates several of the consonants for use either initially or finally on the keyboard. Unlike the typewriter, which is operated by striking one key at a time, the stenotype prints its letters laterally on a wide tape, and always in the same position, so that it is possible to register as many as 20 letters, two to a finger, with one stroke.

Shorthand is now taught in all business and commercial schools, as well as in the secondary, special, and public and private high schools. Stenotypy is taught in private business and commercial schools, but it is expected that courses in this system will shortly be introduced into public and private high schools. Among the systems in use in America, in addition to Pitman and Gregg, are Graham, Munson, Benn Pitman, and to a lesser degree, Cross Eclectic Shorthand, and the systems invented by Pernin and McKee. For the reporting of speeches, conventions, sermons, courts, and Federal, state and municipal boards and bureaus, however, Pitman, Gregg, and stenotypy are universally employed.

The number of words and syllables uttered by a speaker in a specified time varies widely in individuals and in different languages, but shorthand reporters generally agree that the speed of uttered speech has increased measurably within the past generation. In court proceedings 175 words per minute is considered to be the average, but it is not at all uncommon to find trials in which 200 and 220 words per minute is the average speed. In competitive tests 280 words per minute have been written by many expert shorthand reporters with a high degree of accuracy. Speeds of well over 300 words per minute have been attained by several shorthand and stenotype writers for short periods of time in demonstrations and exhibitions. The expert shorthand reporter is qualified to take well over 200 words per minute for sustained intervals, and to write 250 and even higher in spurts.

Shorthorn (*shôrt'hôrn*), a certain breed of beef and dairy cattle, originally produced in England, now distributed all over the world; characterized by short, fine, well curved horns, usually white with dark tips.

Short Waves (*shôrt wāvz*). See *Frequency*.

Shoshone Falls (*shô-shō'nê fa̤lz*), a remarkable cataract in Idaho, on the Snake River. The current is about 950 ft. wide and falls in the form of a semicircle, the height being about 210 ft., exceeding that of Niagara Falls by 40 ft. Precipitous walls of rock fully 1,000 ft. high form barriers on both sides of the river, and 4 m. up the river are the Little Shoshone Falls. See *Snake River*.

Shoshones (*shô-shō'nēz*), or SNAKES, an American Indian tribe, formerly resident in the region now occupied by Utah, Idaho, and Nevada. They include a number of bands, among them the Buffalo Eaters and White Knives. Lewis and Clark first came in contact with them while penetrating the regions beyond the Rocky Mts. in 1805 and found them a peaceful class of natives. The advancement of settlers was the occasion of hostilities near the Humboldt River and Great Salt Lake in 1849, and these were succeeded by battles in 1863. A treaty was made with the tribe in 1867, when the government assigned them land in Nevada, Utah, Idaho, and Wyoming. They include about 5,750 at the present time.

Shostakovich (*shŭ-stŭ-ḳŏ'vyĭch*), DMITRI, composer, born Sept. 25, 1906, in St. Petersburg (now Leningrad), Russia. However much he has deviated from the usual style of modern composition, the sound training he received at the Petrograd Conservatory in piano, composition, harmony, and counterpoint is basic and evident in all his compositions. In 1926, he had written his First Symphony, publicly performed in Leningrad immediately, and soon taken over into the programs outside his native country. His art and his life have been always influenced by Russian revolutionary tendencies and his own words ". . . there can be no music without ideology" clearly show his standpoint. His Second Symphony, composed in honor of the 10th anniversary of the Soviet Republic, and called October Symphony, as well as the following Third Symphony, did not meet with as much enthusiasm as the first; his first opera, "The Nose" (1929), an allegorical and satirical piece based on a tale by Gogol, shows in subject, treatment, and form in some measure the influence of new Western operas by Krěnek, Hindemith, etc., then being performed in Leningrad, using atonality, *Sprechstimme,* etc. His second stage work, "Lady Macbeth of Mzensk" was called "formalistic" and violently attacked by critics of the Communist party newspaper of the U.S.S.R. However, Shostakovich has re-won his place as the representative of modern composition in Russia. His Fifth Symphony (1938), and Sixth Symphony, successful in Russia and in this country, were overshadowed by his Seventh Symphony—called the Leningrad or Blitz Symphony—which commemorated the heroic defense of Leningrad against the Germans' siege in World War II. His later works—including his Ninth Symphony (first performed in the U.S. at the Berkshire Music Festival in 1946), an impressive piano concerto, and some chamber music—prove Shostakovich's great and unusual musical gift. No matter how eclectic or uncommon they may be, they never fail to impress by their soundness.

Shot (*shŏt*), the general name applied to pellets and projectiles used in firearms of various kinds. Round stones were first employed for shot when powder came into use, but it was soon found that a regularly formed ball made of metal is more convenient and far more effective for all purposes. For artillery, solid shot is not used as extensively as formerly, but hollow projectiles are employed instead. The size of the shot varies materially with the kind of guns from which it is to be thrown, ranging from very small pellets to projectiles weighing about a ton. The material used is cast iron or steel, but the missiles are prepared differently, depending upon the purposes for which they are to be employed. They include canister, grape, shrapnel, bar, and numerous others.

Canister shot is made up of small iron or lead balls placed in a sheet-iron can, which is designed to burst on leaving the gun. *Grapeshot* is made of a number of small cast-iron balls, so adjusted that they may be thrown in a body from the gun. *Shrapnel shot* is made by placing a number of musket balls in a cast-iron shell and filling the intervening spaces with sulphur or resin. This material is added to harden and form the balls into a solid mass, and powder is afterward placed within to burst the shell on striking the object against which the shot is thrown. *Bar shot* was formerly employed to destroy the rigging of a ship. It consisted of disks of iron joined by a bar, but a chain was sometimes used for a like purpose.

Sportsmen use pellets of lead of various sizes, depending upon the kind of game hunted. The finer grades are more serviceable for small animals, as they are less likely to damage the flesh, while larger classes are needed to kill more bulky game, such as geese and brants. Shot of this kind is made by melting the lead and dropping it through sieves from a high tower into water. The dimension of the shot depends on the size of the hole of the sieve or colander through which the metal passes. As they fall through the air they become cooled and hardened. Shot towers vary in height from 100 to 150 ft. After the shot has been dropped from the top, it is separated according to the different sizes and polished. A newer process is to mold the metal by running it in a molten state into a trough and allowing it to drop through little holes into molds, which discard the pellets as soon as formed and drop them into a bed of graphite.

Shotgun (*shŏt'gŭn*), a shoulder weapon designed to project a number of spherical lead pellets (shot) in a scattered pattern. Although occasionally standing shots—say, for game such as deer—call for a single ball or a rifle slug, the present-day shotgun target is normally a moving one, calling for scattered shot. The moving target may be upland game birds, waterfowl, so-called undesirable birds, or clay "pigeons." Clay pigeons are breakable targets thrown from a spring-actuated device for trap or skeet shooting.

The shotgun barrel is smooth-bored, in contrast to the rifle barrel, which has spiraling grooves (see *Rifle*). The muzzle end of a shotgun has a constriction known as the *choke*. The amount of constriction or choke governs the size of "pattern" made by the shot at a given range.

It is customary to pattern shotguns at a distance of 40 yds. Shot are fired at a plain paper target. A circle with a 15-in. radius is then scribed around the densest part of the pattern and the encircled shot hits are counted. The manufacturer's specifications give the approximate number of shot in the load. Pattern percentage is thus easily determined: shot count in the 30-in.-diameter circle divided by the specified number of shot in the load. Skeet guns which are used at close range are sometimes patterned at 20 yds., the pattern percentage being determined from the hits in a 20-in. circle.

Four general kinds of choke boring are used in the U.S. Degree of choke is determined by the pattern percentage rather than by the physical dimensions of the barrel. The names corresponding with pattern percentages, and used in specifying barrels, are full choke (70%), modified choke (60%), improved cylinder (50%), and cylinder bore (40%).

The calibers of shotguns and shotgun cartridges are designated by *gauge* except for the .410 which is named from its bore diameter in inches. Gauge designation is a carry-over from earlier days and refers to the number of round lead balls, made the diameter of the bore, to the pound. In other words, if a pound of lead were divided into 12 round balls, the diameter of each one would be the approximate diameter of the 12-gauge shotgun bore.

TABLE OF SHOTGUN GAUGES

Gauge	*Bore Diameter in Inches*	*Gauge*	*Bore Diameter in Inches*
8	.835	20	.615
10	.775	24	.579
12	.729	28	.550
14	.693	32	.502
16	.662	.410	.410

The effective killing range of the shotgun depends largely upon the degree of choke and the size of shot used. The larger shot has the greatest killing power at the longer ranges but, if the choke being used produces a sparse pattern, the effective range has, of course, been exceeded. Effective ranges with the shotgun vary from 30 to 80 yds., depending upon the gun, the load, and the type of target. Maximum ranges vary with the size of shot (about 200 yds. for No. 8 and about 350 yds. for No. 2).

Five general types of modern shotguns are available. (1) Double barrels, side by side, break action. (2) Double barrels, over and under, break action. (3) Single barrel, break action. (4) Single barrel pump-action repeater. (5) Single barrel semi-automatic.

For the last 60 years shotgun barrels have been made of steel. Early gunsmiths used a variety of materials, including brass and wrought iron, for barrels. Before early 19th century experiments with Damascus iron, barrels were forged from plates or strips of iron. Damascus barrels proved to be stronger than the previous twist barrels and strong enough for the black-powder cartridges which were used exclusively before the introduction of nitrocellulose powders. However, they are not so strong as modern steel barrels and gun experts discourage their use with modern high-pressure ammunition.

Shultze powder, having a nitrated wood fiber base, was developed in 1867. The E.C. Powder Co. was producing a nitrocellulose powder in 1882. Modern smokeless powders develop much higher pressures than the old black-powder loads.

M. Lefaucheux developed the pin-fire shotgun cartridge in 1836. This was a breech-loading cartridge with a pin protruding from the side of the head. The pin struck by the falling hammer impinged on the priming mixture and fired the cartridge. Various forms of cartridges finally led to the present type with the boxed primer.

Sporting shotguns have been in use since the days of the wheel-lock in the late 16th and early 17th centuries. Some of the early wheel-lock shotguns were as small as .35 in. caliber and exceedingly long (some were 6 ft. or more in length).

Joseph Manton, a famous London gunsmith (*ca.* 1800), is credited with doing more to develop the shotgun in its present form than any other individual. Since breech-loading guns were not yet in use, Manton's masterpieces were muzzle-loading flintlocks or percussion-cap type. The outward lines of the Manton guns are nevertheless the same as those of the present day.

There is some question as to who invented choke boring; however, on the strength of a patent he had taken out in 1866, W. R. Pape of Newcastle is usually considered its inventor.

Shoulder (*shōl′dẽr*), anatomically, the region where the arm is attached to the trunk. The bony structure consists of the clavicle (collar bone), scapula (shoulder blade), and the head of the humerus (upper arm), which meet to form the shoulder joint. The important muscles of the region are the trapezius, pectoralis major and minor, deltoideus, supraspinatus and infraspinatus, latissimus dorsi, terres major and minor, rhomboideus, biceps, and triceps. See *Anatomy; Skeleton*—illustrations.

Shoveler (*shŭv′′l-ẽr*), or SPOONBILL, the name of several species of duck, so called from the form and size of their bill. The common shoveler, though smaller than the mallard, is highly esteemed for its flesh. The female has dull plumage, but the male is finely decorated.

Shovell (*shŭv′ĕl*), SIR CLOUDESLEY or CLOWDISLEY, English naval commander, born 1650; died 1707. Joining the fleet at an early age, Shovell became distinguished for his raids upon enemy pirates. After breaking through the French and Spanish enemy fleets in 1702, he was appointed a rear admiral, becoming commander-in-chief of the British fleet two years later. He was killed when his ship ran aground on some rocks near Sicily, after an unsuccessful attempt to seize the port of Toulon. He is buried in Westminster Abbey.

Showboat (*shō'bōt*), a steamboat carrying a theatrical troupe along rivers and other inland waterways, presenting entertainment in the various ports. Showboats became a special feature of the Mississippi River in the mid-19th century. Also, the title of a novel (1926) by Edna Ferber (*q.v.*), which was the basis of the musical comedy "Showboat" (1927), with score by Jerome Kern (1885-1945), and the moving picture of the same name.

Shrapnel (*shrăp'nel*). See *Shot.*

Shreveport (*shrēv'pōrt*), second largest city in Louisiana, seat of Caddo parish, on the Red River, 200 m. E. of Dallas, Tex. It is on the Kansas City Southern, Louisiana & Arkansas, Illinois Central, Southern Pacific, St. Louis & Southwestern, and other railroads. It is served by the Delta, Chicago & Southern, and Mid-Continent Airlines. The elevation of the city is between 170 and 280 ft. above sea level. The principal industries include metal working, petroleum products, glass, clay products, chemicals, wearing apparel, and food processing. The chief points of interest are Barksdale Field Air Force Base (one of the world's largest airports), Louisiana State Exhibit Building, Cross Lake, Centenary Coll. (the oldest college west of the Mississippi River), and oil and gas fields. The city was established as a river port in 1835 by Capt. Henry Miller Shreve and incorporated in 1839. Population, 1900, 16,013; 1960, 164,372.

Shrew (*shrū*), a genus of animals resembling the mouse and the dormouse, but distinguished from them in having soft fur and an elongated muzzle. A large number of species has been enumerated, of which the *common shrew* is the best known. It is about the size of a mouse, but has a prolonged muzzle, small eyes, and a four-sided tail. The ears are short and the color is brownish-black. The food consists of insects, worms, and the smaller mollusks. The animals come out in search of food at night and are noted for their tendency to fight, the stronger often killing and eating their weaker opponents. The *shrew mole* of North America includes several species and is very nearly allied to the moles. Several species are common to Europe, all more or less similar to the American species, but differing from them in various respects, especially in being larger and having longer legs. The *water shrew* is larger than the American shrew mole and the snout is quite pointed. It is frequently seen on the banks of streams and lakes, often entering the water. Some species burrow in the fields and gardens in search of worms, which is true of the American shrew mole.

Shrike (*shrīk*), a genus of birds of the insessorial family, widely distributed in America, Europe and other continents. The food consists of insects, frogs, mice, and small birds, receiving from their habit of killing other birds the name of *butcher bird*. The *great American shrike* is about 10 in. long. It has a grayish color with whitish markings, and is able to imitate the voice of other birds. About thirty other American species have been described, some of which are native to South America. The *red-backed shrike* of Europe is about 8 in. long, and the *great gray shrike* of Asia and North America approaches the thrush in size.

Shrimp (*shrĭmp*), a small marine crustacean (see *Crustacea*) belonging to any of several genera, many of which are valued as food. The various genera range in size from 1 in. to 6 in. or more, the larger species sometimes being called *prawns*. The common shrimp, somewhat resembling the lobster and crayfish, differs from them in having an elongated, tapering, and arched body. The claws are small, the beak is short, and the tail is long and fanlike. When alarmed, the shrimp burrows in the sand or seeks safety under rocks or pebbles. Some species exhibit protective coloration, taking on the mottled grayish-brown color of wet sand. When boiled, shrimp flesh turns a characteristic pink in color.

Shrimp fishing is an important industry in Japan and in coastal states of the southern U.S., from North Carolina to Texas.

Shrovetide (*shrōv'tīd*), the days immediately preceding Ash Wednesday, at which time Roman Catholics are accustomed to confess their sins as a preparation for Lent. Shrove Tuesday has long been considered a season for feasting and merriment, and is still called *Mardi Gras* by the French.

Shubrick (*shū'brĭk*), WILLIAM BRANFORD, naval officer, born on Bull's Island, S.C., Oct. 31, 1790; died in Washington, D.C., May 27, 1874. He served on the *Hornet* and *Constellation* in the War of 1812, aiding in the defense of Norfolk against the British. Later he commanded in the West Indies and in the Mexican War. From 1854-58, he was chairman of the lighthouse board, and in the latter year took command of an expedition against Paraguay to obtain reparation from that country for firing on the steamer *Water Witch*. He retired with the rank or rear admiral in 1862, but served as chairman of the lighthouse board until 1870.

Shuffleboard (*shŭf'f'l-bōrd*), or SHOVELBOARD, a game played by two or four persons with iron weights, on a board sprinkled with fine sand. The board is 30 ft. long, with raised edges, and is marked off into scoring zones by the *deuce line* and the *trey line*. A weight shuffled short of the deuce line into the zone nearest the players' end of the board scores one point; weights lying between the deuce and trey lines score two points; those between the trey line and the end of the board score three points. Weights that move beyond the trey line and extend over the edge of the board (without falling off) are called *hangers* or *shippers,* and score four points, as do those that stop within two small zones in the right and left corners of the board. A hanger weight resting in either of these small zones scores six points. Players alternate shuffling until all weights have been used, whereupon play shifts to the opposite end of the board for the next inning. A singles game (two players) consists of 15 points, doubles (four players) of 21 points. Only those weights may score which are beyond any of the opposing weights. Shuffleboard is also a popular game on shipboard, where it is played on a figure outlined on the deck; wooden weights are used and they are shuffled by a long staff with a curved end.

Shu King (*shōō king′*), a Chinese sacred book also known as the "Book of Historical Documents," the preface of which is said to have been written by Confucius (*q.v.*).

Shupham (*shōō′făm*) or SHUPPIM (in Hebrew, "serpent"), a descendant of the Biblical Benjamin, and founder of the Shuphamite clan (Numbers 26:39; 1 Chronicles 7:12,15; 26:16).

Shur (*shûr*), in the Bible, a desert between Egypt and Palestine, mentioned in connection with Hagar and with the Exodus (Genesis 16:7; 20:1; 25:18; Exodus 15:22; 1 Samuel 15:7; 27:8).

Shuster (*shōō′stẽr*), GEORGE NAUMAN, educator, writer, editor, born in Lancaster, Wis., Aug. 27, 1894. He was educated at the Univ. of Notre Dame and at Columbia Univ. He taught English at several universities and joined the staff of the *Commonweal,* becoming managing editor in 1929. Resigning in 1937, he spent two years as a fellow of the Social Science Research Council. In 1939 he was appointed dean and acting president of Hunter Coll. in New York City, becoming president the following year. He retired from this position in 1961.

From the time of World War I, one of Shuster's principal interests was a study of Germany, particularly in its social and economic aspects. In 1939 he edited an English translation of Hitler's *"Mein Kampf."* His books include "The Catholic Spirit in Modern English Literature" (1922), "The Germans" (1932), "Like a Mighty Army" (1935), "Look Away" (his only novel, 1939), "Religion and Education" (1945), "Germany; A Short History" (with Arnold Bergstraesser, 1945), "In Silence I Speak" (with Tibor Horany, 1956), and "The Ground I Walked On," an autobiography (1961).

Shuswap (*shōō′swŏp*), the most important Indian tribe of the Salishan linguistic stock, inhabiting British Columbia. They were first encountered by Alexander Mackenzie in 1793 and later by Simon Fraser (1808). They controlled most of the area between the Columbia River watershed and the Fraser River, including the drainage of the Thompson River above Kamloops, and a large part of the valley of the Columbia River above the Arrow Lakes. The advent of miners into their area in 1858 introduced great changes in their lives, and their numbers were reduced by at least half. They depended mainly on hunting and fishing for subsistence. At present, there are about 2,600 Shuswap occupying a number of small village reservations.

Shute (*shōōt*), NEVIL, pen name of NEVIL SHUTE NORWAY, author, born in Ealing, Middlesex, England, Jan. 17, 1899; died in Melbourne, Australia, Jan. 12, 1960. Educated at Balliol Coll., Oxford, he became an aircraft engineer after World War I and served as chief engineer for the construction of the experimental airship R-100, which flew the Atlantic twice in 1930. From 1931 to 1938 he was joint managing director of an airplane construction company which he founded. In the latter year, having already published three novels, he retired to devote himself to writing. During World War II he served with the British Admiralty (1941-45), after which he moved to Australia. His many novels include "Kindling" (1938), "The Pied Piper" (1942), "The Far Country" (1952), "On the Beach" (1957), and, posthumously, "Trustee From the Toolroom" (1960) and "Stephen Morris" (1961); also an autobiography, "Slide Rule" (1954).

Shvernik (*shvĕr′nik*), NIKOLAI MIKHAILOVICH, Soviet official, born near St. Petersburg (now Leningrad), Russia, May 19, 1888. He joined the Communist revolutionaries in 1902; by 1925 he was a member of the party's central committee. He became an alternate member of the Politburo in 1939 and in 1957 rose to full membership. He was made first vice chairman of the Presidium of the Supreme Soviet in 1944, and from 1946 to 1953 served as chairman, a post equivalent to president of the U.S.S.R. After the death of Stalin (1953) Shvernik was given a number of important assignments. He was a member of the tribunal that sentenced Lavrenti P. Beria to death (1953), and, in later political realignments, he retained his membership in the presidium of the party's central committee.

Si (*shē*) or SI-KIANG (the West River), a river in south China, *ca.* 1,000 m. long, formed by the junction of the Hungshui and the Siang rivers. The Hungshui rises in Yunnan Province and flows east to Kwangsi Province, where it unites with the Siang, and thence through Kwantung Province into the South China Sea. One of the important waterways of China, the Si is navigable for large ships below the confluence of the Hungshui and the Siang.

Siam (*sī-ăm′*), officially known as THAILAND—in Siamese, Muang-Thai ("the land of the free") or, alternately, Prades Thai—an independent kingdom of southeast Asia. It is situated on the northern and western coasts of the Gulf of Siam. On the extreme S. it is bounded by the Federation of Malaya, on the S.W. by the Andaman Sea, on the W. by Burma, on the N. by Burma and Laos, on the E. by Laos, and on the S.E. by Cambodia. On the land side, Siam is enclosed by mountains, reaching a maximum elevation of 8,468 ft. (Doi Inthanon) in the northwest near the Burma frontier. A vast alluvial plain drained by the Menam (River) Chao Phrya dominates the central part of the country. The total area of the country is estimated at 198,456 sq. m.

DESCRIPTION: The country is divided into several regions. Northern Siam, occupying *ca.* 60,000 sq. m., is a mountainous area, comprising a series of roughly parallel hill ranges, often of granite, running generally north and south, and separated by deep valleys composed of old sediments. The forested hills rise gradually toward the north and west, merging into the impressive heights of the Tanen Taunggyi range. Central Siam, occupying about 55,000 sq. m., is an alluvial plain, much of which is flooded in the rainy season. It is intersected by rivers which change their courses frequently. This region is the rice bowl of Siam. Eastern Siam, with an area of about 55,000 sq. m., is often referred to as the Khorat Plateau. It is tilted slightly toward the east, determining the general drainage toward the Mekong River. Much of the region is covered with thin scrub, and it is only sparsely populated. Southeastern Siam is a relatively small area, to the east and southeast of Bangkok; it is partly an extension of the plains of central Siam. Much of the region has a dry-type scrub forest. Peninsular Siam is an area of limestone hills covered with evergreen forests, interspersed with occasional flat plains.

The climate is governed by alternation of the monsoons. From the latter part of April to mid-October the prevailing winds blow from the southwest; during the rest of the year they are from the northeast. May to October—the period of the southwest monsoon—is the rainy season, except in peninsular Siam, where heavy rains fall even during the northeast monsoon. The weather is dry for the remainder of the year. Bangkok, the capital, has an average annual rainfall of about 57 in.

For most of the year, the weather is hot. In Bangkok, the average mean temperature is 83° F. The coolest season is between November and January, when the thermometer drops to 62° F. In the north, it may fall to 40° F. at night. April is generally the hottest month; the temperature reaches 100° F. Eastern Siam has the greatest range in temperature, while the peninsula has the most equable climate.

RESOURCES: Rice and agriculture are almost synonymous terms in Siam. Rice cultivation dominates all farming, and the cereal represents about 60 per cent of the country's export trade. Apart from small patches of vegetables grown for the use of individual families, the greater part of the cultivated land is occupied by rice fields. The government has encouraged diversification in agriculture. Rubber, cotton, and tobacco are grown in quantity in the south, and rubber exports amount to about 10 per cent of total export value. Also grown are soybeans, peanuts, corn, coconut palms

Courtesy Canadian Pacific Steamships

GUARDIANS OF THE GRAND PALACE IN BANGKOK

British Official Photo

PEACE CELEBRATION AT BANGKOK, SIAM, IN 1946

for copra, areca palms for betel nuts, sago palms, sugar palms, and many tropical fruits. Fisheries rank second only to agriculture in volume as well as value. Buffaloes and bullocks are used as draft animals, and elephants for hauling logs in teak forests. About 60 per cent of Siam consists of forest; and teak is the chief forest product. Ebony, rosewood, ironwood, rattan, sapanwood, stick-lac, and thingan wood are also significant.

Mining has limited importance to the national economy. Tin is the most important item. Tungsten is often found in association with tin. There is limited exploitation of low-grade iron ore and lignite. Also found are gold, silver, lead, copper, rubies, and sapphires.

Manufacturing: Manufactures are confined largely to foods processed for local use, building materials, cigarettes, matches, furniture, and handicrafts. Significant effort is being made by the government to expand manufacturing, particularly of cotton textiles.

Population: Except for a few Negritos in the mountains, the people of Siam are of Mongoloid stock. There are some 300,000 Chinese and 700,000 Malayans. Cambodians, Laotians, and Vietnamese constitute other significant minorities. The total population, predominantly rural, was estimated (1958) at 21,474,000. Bangkok, the capital, had a population of over 1,000,000. Other major cities include Songkhla, Chiengmai, Khorat, Khonkaen, and Nakorn Pathom. The population is predominantly Buddhist, and Buddhism is the state religion.

Language and Literature: The Thai language belongs to the Sino-Tibetan group, which includes Chinese, Burmese, and Tibetan. It is known as an isolating language, one which does not have inflectional or grammatical endings. It originally consisted of words of one syllable, but it has become steadily more dissyllablic (having two syllables) in character through the formation of word combinations. The writing system is based upon pictograph and ideograph signs, and the alphabet is of Indian origin. To avoid confusion in the meaning of homonyms, of which there are many in the language, a tonal system is used in which meaning is indicated by the pitch at which the word is intoned. The modern alphabet contains 28 consonants and their variants.

Representative Thai literature is based upon early legends and is frequently written in poetic prose or a mixture of verse and prose. The stories, often in the form of long collections, contain many references to myth and magic and deal with problems of war and love in the lives of princes and semidivinities. Many of the superstitious beliefs and customs of the people are contained in the short rhymed poem *"Swasdi Raksa"* by the poet Sunthorn Bhu (1786-1855). Classic works include *"Phra Law,"* the romantic story of a provincial king in the north of Thailand, and *"Mahachat Kham Thet,"* which deals with one of the incarnations of the Lord Buddha.

Aerofilms, from Ewing Galloway

BANGKOK, SIAM

An air view of the Wat Aran Temple, an outstanding landmark in a country noted for its architecture

Education: Modern teaching methods and educational reforms have spread widely in Siam, and the literacy rate is about 60 per cent. Education is offered in government, private, local public, municipal, mission, and some technical schools and is compulsory for children between the ages of seven and 14. There are about 35 training colleges in the country, and five universities are located in Bangkok.

Government: Siam is a constitutional hereditary monarchy, governed by a king (Bhumibol Adulyadej, Rama IX), who is, in fact, the titular head of the state and the Defender of the Faith (Buddhism). His functions are essentially ceremonial. The constitution, adopted in 1952, but abrogated in 1958, provides for a national assembly, to which a state council, or cabinet, is responsible. Under the constitution, the king appoints the speaker of the assembly and designates the prime minister, on the advice of the assembly.

Administratively, the country is divided into changwats, or provinces, headed by governors appointed by the ministry of the interior. Recently nine regional "areas" were established over these provinces, each administered by a commissioner, also appointed. Under these groupings are subdivisions known as tambons (communes) and amphurs (districts).

Military service, for two years, is compulsory for men between 18 and 23; and the total peacetime strength of the armed forces is about 45,000 officers and men.

HISTORY: The Siamese, according to tradition, came into the country in the 5th century B.C. The recorded history, however, begins with A.D. 1350, when Ayudhya, or Ayuthia (*ca.* 40 m. N. of Bangkok), became the national capital, which it remained until 1767, when it was destroyed by the Burmese. Cambodia was annexed by Siam in 1532. Siam and Portugal established commercial relations in 1511, and in the early 17th century the British and Dutch assumed control of Siam's foreign trade. An antiforeign revolt in 1688 closed the country to all foreigners for over a century. In 1782 Yaut Fa ascended the Siamese throne and established the present ruling dynasty (Chakri dynasty).

Siam signed her first treaty of friendship with Great Britain in 1826, signed a similar treaty with the U.S. seven years later, and subsequently entered into treaties with other nations. With the outbreak of World War I, Siam joined the Allies, later becoming a member of the League of Nations. In 1932 a constitutional monarchy was established as a result of a bloodless coup of high army and civil service officials, who were supported by the intelligentsia. On Dec. 21, 1941, under Japanese pressure, Siam declared war against the U.S. and Great Britain; after the defeat of Japan, Great Britain and Siam signed a peace treaty (Jan. 1, 1946), and in the following December Siam was admitted to the U.N. In 1947 Siam's parliamentary government was overthrow by a military *coup d'état* led by Marshal Pibul Songgram, and thereafter the political situation was unstable, with Marshal Sarit Thanarat taking over the government in 1957.

Siam became a conscientious supporter of the U.N. and a strong ally of the U.S. She was one of the two Asian countries to send troops to repel the Communist aggression in Korea (*q.v.*). Siam is also a member of the Southeast Asia Treaty Organization (an outgrowth of the Manila Treaty), whose headquarters are located at Bangkok.

Siam, GULF OF, an inlet of the China Sea, lying within the confines of Siam, Cambodia, Cochin China, and the Malay Peninsula. The width at the entrance is 240 m., and it extends inland 400 m. The Chao Phrya and several other navigable rivers flow into it.

Siamese Twins (*sī-ạ-mēz′ twĭnz*), the name of two male individuals whose bodies were inseparably connected from birth by a fleshy ligament stretching from one breastbone to the other, which had on its lower border a common navel. They were born in Siam in 1811. The brothers were named Eng (right) and Chang (left). The connection was such that they faced each other at first, but the fleshy ligament became lengthened by constant strain until they finally stood side by side. When the center was touched, both felt it, but when one side of the tie was touched the person farther from the point of contact did not feel it. These twins were brought to the U.S. for public exhibition in 1829 and visited the principal cities of America and Europe. They later settled in North Carolina and married two sisters. The Civil War caused them to lose a large part of their fortune, which they had accumulated by exhibiting themselves, and they made a second general tour that proved highly profitable. Chang was affected by a paralytic stroke in 1870, which did not materially affect Eng, but the former became affected with a disease of the respiratory organs and died Jan. 17, 1874, Eng dying about three hours afterward. These twins attracted wide attention. Some reputable physicians believed that the ligament connecting them could have been severed without fatal results. The term *Siamese twins* is now used as a general name for similar births of either sex.

Sian (*shē-än*) or CHANGAN, a city in central China, capital of Shensi Province. Located near the Wei River, less than 100 m. from its junction with the Hwang Ho (Yellow River), Sian is an important trade and export center on the overland routes to southern and eastern China. It produces textiles, flour, chemicals, and glassware. The site of Sian has been important in China's history since the time when nearby Hsien-yang served as the capital (3rd century B.C.) of Shih Huang Ti of the Chin dynasty. Under various names, Sian itself was the capital of Chinese rulers for about 900 years, beginning *ca.* 200 B.C. with the Han dynasty. Sian was visited by Marco Polo in the 13th century. In 1913 its name was changed back to Changan, and in 1943 the name Sian was resumed. The city is walled and laid out in a rectangle. It is the site of historic fortifications, temples, and tombs. A Nestorian tablet, found here in 1625, describes a Christian Chinese colony that flourished in the 7th and 8th centuries. Sian was the scene of the kidnapping of Chiang Kai-shek (*q.v.*) by Chinese Communists in 1936. Population, 1957, 1,500,000.

Siang (*shĭ-äng′*) or HSIANG, a river in south central China, in Hunan Province, over 700 m. long. It rises in Kwangsi Province and flows north to Tungting Lake. The river is the major waterway of Hunan Province; an important trade route, it is navigable for large ships from the city of Changsha south. The Siang Valley is devoted to agriculture and to the mining of coal, antimony, and lead.

Šiauliai (*shou-lā′*) or SHAULYAI (formerly SHAVLI), a city in Lithuania, capital of the district of the same name, 75 m. N.W. of Kaunas. It is a shipping and trade center in an agricultural and lumbering region; among its manufactures are leather goods and machinery. The city dates from the 15th century. At the close of World War I, Lithuanian forces defeated the Germans, and the city became part of the Republic of Lithuania. In World War II it was held by Germany (1941-44) until its capture by the Russians. Population, 1939, 31,299.

Sibelius (*sĭ-bä′lĭ-o͝os*), JEAN, born JOHAN JULIUS CHRISTIAN SIBELIUS, in Hämeenlinna, Russia (now Finland), Dec. 8, 1865; died near Helsinki, Finland, Sept. 20, 1957. Sibelius started piano lessons at the age of nine, and violin lessons at the age of 15, studying composition by himself, and after a year at the Helsinki Conservatory he turned to composition. Pursuing his musical education, he was nonetheless a student of law at Helsinki Univ. Public performance of his early compositions brought Sibelius in 1889 a scholarship and grant for study abroad. He became the pupil of Albert Becker (counterpoint and fugue) in Berlin and also studied in Vienna under Karl Goldmark (instrumentation) and Robert Fuchs, the Brahms scholar.

Sibelius' symphonic poem in five parts for soli, chorus, and orchestra, the "Kullervo," was a tremendous success at its first performance on April 28, 1892, as was his extremely original and fantastic tone poem, "En Saga," in the same year. Although he did not consciously use the folk idiom in these or any of his works, his plain themes were an expression of the moods of the Nordic people. Compositions such as "Spring Song" (1894), a melancholy and sensuous piece for orchestra, and four "Lemminkäinen" legends, from the "Kalevala," followed between 1893 and 1899, the best known of them being "The Swan of Tuonela."

In 1897 the Finnish government voted Sibelius an annual pension of 2,000 marks, a figure which was greatly increased in 1926. In 1899, after a visit to Munich, Baireuth, and to several Italian cities, Sibelius began to compose his romantic First Symphony, a somewhat derivative work in the tradition of Tchaikowsky. The Second Symphony, written in 1901, was much more virile and original. The tremendous tone poem, "Finlandia," composed in 1899 to accompany a patriotic tableau, became known all over the world, as did a similar work, "Pohjola's Daughter," written seven years later.

With the year 1911, an important change of style became apparent in Sibelius' work. It no longer stressed programmatic values and became distinctly a music of mood and thought. Although Sibelius was in no way affected by the European movement in modern music, his Fourth Symphony employed entirely new harmonic patterns, approaching atonality and the use of the 12-tone scale. Among the symphonies that followed—making seven in all—the Seventh Symphony (1924), with its magnificent harmonies and serene dignity, was a masterpiece of invention and formal construction.

Courtesy Press Association, Inc.

JEAN SIBELIUS

Although Sibelius produced his finest work in the large symphonic form, he also wrote chamber music, works for the violin, cello, and organ, as well as piano, choral, and vocal works. Best known among his minor orchestral works are the incidental music to some of the plays of Shakespeare, Strindberg, and Maeterlinck and the symphonic poem "Tapiola," which had its première in New York in 1925. A musician of great culture and a powerful art, definitely influenced by European romanticism, Sibelius wrote music which was completely individual; its spontaneity and primitive force made him the exponent of both the ancient and the modern cultures of Finland.

Siberia (*sī-bēr′ĭ-ą*), an extensive region of the U.S.S.R., geographically comprising the northern part of Asia, and politically forming part of the Russian Soviet Federated Socialist Republic (*q.v.*). It is bounded on the N. by the Arctic Ocean, on the E. by the Bering Sea and the Pacific Ocean, on the S. by Manchuria, the Mongolian People's Republic, and the Kazakh Soviet Socialist Republic, and on the W. by the Ural Mts., which separate it from European Russia. Much of the southern boundary is formed by such natural features as the Amur River, which separates it from Manchuria, and the Yablonoi Mts., in the east central part. Its area is *ca.* 4,994,818 sq. m., which is greater than that of all Europe.

DESCRIPTION: Physiographically, Siberia is made up of three great natural divisions: (*1*) the tundra in the north, a frozen desert, only the surface of which thaws during the short summer; (*2*) the taiga, or forest belt; and (*3*) the steppes, a vast, treeless plain. Between the taiga and the steppes, there is a less well defined area consisting of steppe-type plains with occasional wooded areas. The region is traversed from south to north by great rivers, including the Ob, Yenisei, Lena, and Khatanga.

From west to east, Siberia can be divided in another way, into regions bounded by great river and mountain systems and showing significant climatic variation. These regions are Western Siberia, Eastern Siberia, and the Far East.

Western Siberia is the area between the Ural Mts. and the Yenisei River. It is the most densely populated and the most advanced economically and industrially. The tundra region in the north is comparatively narrow; it gives way to the taiga, a vast expanse of coniferous forests that takes in some two-thirds of the territory. In the south are the steppes, the area most hospitable to man.

Eastern Siberia lies between the Yenisei River and the mountains of the Pacific coast. It is a land of uplands, plateaus, and mountains. The tundra region here is extensive, as is the taiga; the steppes are relatively narrow.

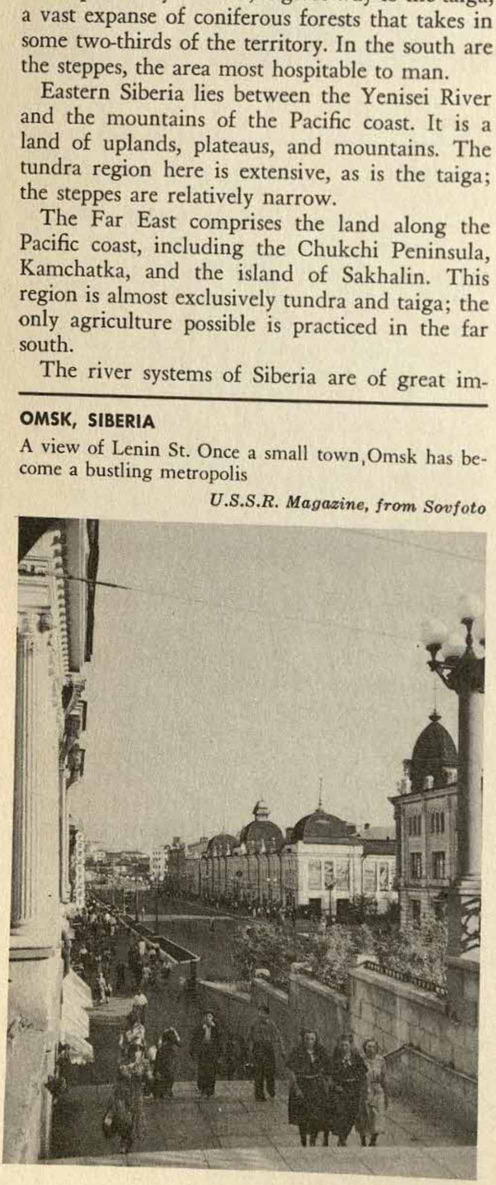
The Far East comprises the land along the Pacific coast, including the Chukchi Peninsula, Kamchatka, and the island of Sakhalin. This region is almost exclusively tundra and taiga; the only agriculture possible is practiced in the far south.

The river systems of Siberia are of great importance both agriculturally and economically. From north to south, the only important means of transportation is the rivers, and these are navigable for only six or fewer months of the year. Among these rivers are the Ob, Yenisei, Lena, and Angara and their tributaries. There are many lakes, of which the most important is Lake Baikal in Eastern Siberia, the world's deepest lake (*ca.* 5,715 ft.).

OMSK, SIBERIA

A view of Lenin St. Once a small town, Omsk has become a bustling metropolis

U.S.S.R. Magazine, from Sovfoto



Resources and Industries: Siberia's natural resources are among the richest in the world, although not until the 1950's was progress made toward exploiting them fully. Western Siberia has a wealth of coal, metal ores (particularly iron), and timber. The Kuznetsk Basin, in the south at the foot of the Altai Mts., one of the world's richest coal regions, was in process of intensive industrialization in the late 1950's. The city of Stalinsk had become an important metallurgical center, and at Novosibirsk a great hydroelectric dam was built on the Ob River. The important agricultural belt in the south produces grains and dairy products; there is also considerable raising of livestock.

In Eastern Siberia, timber is the most important resource. Mineral wealth includes vast coal deposits (largely in the frozen north, where it must await technological improvements before exploitation is possible); iron, manganese, gold (the most important mineral resource of the region), mica, and salt. Exploitation of this wealth has only begun with the first steps toward harnessing the region's enormous hydroelectric potential through installations on the Angara River near Irkutsk and Yakutsk. The Bratskaya Dam on the Angara at Irkutsk, near completion in 1959, was expected to produce one and a half times as much electric power as the Kuibyshev Dam on the Volga River, the world's largest when it was opened. It was also designed to make Irkutsk an important inland port, creating an artificial lake that would become an arm of Lake Baikal. Agriculture in Eastern Siberia is limited to the southern steppes, and there principally to the growing of grains.

In the Soviet Far East, the only agriculture possible is in the far south. The most important natural resources, other than timber, are fur-bearing animals (fox, sable, squirrel, and others) and great quantities of fish, whales, and seals. There are deposits of coal and tin, almost completely undeveloped.

The industrial development of Siberia has been seriously handicapped by transportation difficulties. The only east-west land route is the Trans-Siberian R.R. The U.S.S.R., however, has concentrated intensely on Siberia in recent years in efforts both to settle and industrialize the region. Much of the concentration has centered on the Irkutsk-Lake Baikal region, where in the 1950's a metallurgical center was planned as great as that of the Kuznetsk region. Also under study were plans for exploiting the region's hydroelectrical potential and for developing major chemical industries. Timber also figures largely in Soviet plans for Siberia, as does development of an engineering industry to provide machinery for home use and for export.

Important in the industrial plans for Siberia has been the necessity of providing manpower. Working against government plans are the inhospitable climate and the lack of private-enterprise incentives. Many Russians have been reported to fear that if they volunteered as pioneers in Siberia they might not be permitted to return to urban life in European Russia. Inducements have been offered in the form of free transportation, tax abatement, and eased credit, but the rate of migration has been slow and some observers have predicted that the government may resort to compulsory migration.

Population: The population of Siberia consists of Russians and Ukrainians, plus various indigenous tribes. In Western Siberia Russians and Ukrainians predominate; other groups are Finnic and Altaic tribes. In Eastern Siberia there are Russians and Turkic and Finnic groups. In the Far East Russians and Ukrainians make up the majority of the small population; the few indigenous groups include the Chukchi and the Kamchatkans. The indigenous tribes were largely nomadic hunters and fishermen until the beginning of the Soviet regime. Many have now turned to agriculture, although in the north hunting and fishing remain the principal occupations.

LAKE BAIKAL, SIBERIA

The deepest lake in the world, set amid splendid mountain scenery

Courtesy Sovfoto

Courtesy Sovfoto

THE STEPPES OF SIBERIA

An ancient stone statue dominates the landscape in the Khakass Autonomous Region of the U.S.S.R.

The Greek Orthodox Church is the religion of the majority of Siberian Russians, although there are some Protestant denominations represented. The Asians belong principally to the Moslem and Buddhist religions.

Principal Cities: Novosibirsk, an industrial and transportation center in Western Siberia, on the Ob River. Population, 1956, 731,000.

Omsk, industrial and transportation center in Western Siberia, on the Irtysh River. Population, 1956, 505,000.

Stalinsk, industrial center of the Kuznetsk Basin in Western Siberia, at the head of navigation of the Tom River, site of major metallurgical plant. Population, 1956, 347,000.

Krasnoyarsk, industrial city in Eastern Siberia, a transportation center on the Trans-Siberian R.R. and the Yenisei River. Population, 1956, 328,000.

Irkutsk, major transportation, industrial, and cultural center of Eastern Siberia, on the Trans-Siberian R.R. and the Angara River. Population, 1956, 314,000.

Khabarovsk, industrial and transportation center of the Soviet Far East, on the Trans-Siberian R.R. and the Amur River. Population, 1956, 280,000.

Vladivostok, capital of the Maritime Territory, Soviet Far East; industrial and shipping center, terminus of the Trans-Siberian R.R., principal Soviet port on the Pacific. Population, 1956, 265,000.

Tomsk, industrial and educational center of Western Siberia, on the Tom River, site of a university and numerous technical schools. Population, 1956, 224,000.

History: Siberia was occupied in prehistoric times by various Asiatic tribes and was successively conquered by various invaders, among whom were such peoples as the Turks, the Mongols, and the Manchus. In the 16th century, Tartars from Turkestan established settlements elaborate enough to have a government and a capital—Sibir, which gave its name to the entire region. The Tartars were overthrown by Cossacks in 1581, and in the following year the land was annexed by Ivan IV (*q.v.*) of Russia. The city of Tobolsk was built on the site of Sibir, and by the early 17th century the Russians had penetrated to the Pacific coast. By the treaty of Nerchinsk (1689) Russia relinquished to China the area later known as the Far East, and it was not regained until 1860 in the treaty of Peking.

It was long the hope of the Russian czars to direct emigration toward Siberia, but there was no voluntary movement in this direction, and beginning in the 17th century it was made a penal colony and a place of forced migration for political exiles and convicts. In 1892 construction of the Trans-Siberian R.R. was launched and significant migration began; the population doubled within the next few decades. After the Russian revolution of 1917, many anti-Bolshevik political prisoners were sent to Siberia; and the picture was further complicated by the presence of English, French, Japanese, and American troops who had been sent to maintain order. In addition, Czechoslovak forces moved in and supported the regime of Adm. Aleksandr Kolchak (*q.v.*), who had established an autonomous Russian republic recognized by the Allies. Kolchak organized an anti-Bolshevik army and continued attacks on Bolshevik troops until 1920, when his forces were defeated by the Red Army. By 1922, all of Siberia was incorporated into the U.S.S.R. Under the Soviet five-year plans, Siberian agriculture, especially the cultivation of virgin lands, and industry were advanced. World War II, with its decentralization of Russian industry as a defense measure, also contributed to the shifting of the center of Russian industry farther and farther to the east.

Sibyls (*sĭb′ĭlz*), in Greek and Roman mythology, the name applied to several maidens gifted with the power of prophecy, who were believed to live to incredibly old age. Writers generally placed their number at ten, but one known as

PACK ICE ON LAKE BAIKAL, SIBERIA

The lake becomes a frozen waste capable of supporting heavy vehicles in the long Siberian winter

Courtesy Sovfoto

SIBYL

After a Renaissance drawing

the Cumaean is the most famed from her mention in the sixth book of the Aeneid. She is the reputed writer of nine books in the Greek, known as the "Sibylline Books," which she offered to sell to Tarquin the Proud. Not knowing who she was, Tarquin refused to buy them, upon which she burned three and returned with six, demanding the same price as before. Tarquin again refused to purchase and she burned three more, returning with the remaining three, for which she asked the same price as at first. Amazed at her inconsistency, Tarquin consulted the Augurs, who advised him to buy the remaining three at whatever price they were to be had. He found the volumes to contain valuable predictions, but the Sibyl vanished after the disposal of the books.

The Sibylline books were subsequently consulted on occasions of national danger. They were carefully preserved in the temple of Jupiter Capitolinus, but were destroyed when that structure was burned in 83 B.C. Later the senate sent delegates to different cities of Italy and Greece to collect and, if possible, restore the Sibylline verses, but it was possible to secure only about 1,000, which received a place in the new temple of Jupiter Capitolinus. Stilicho burned this collection in 408 A.D. Another collection of so-called Sibylline oracles was written by Jews and Christians in Alexandria, Egypt, in the period between the advent of Christ and the 6th century A.D. This collection is entirely distinct from the Sibylline verses of the Greeks and Romans. It was published in 14 books and had 4,000 lines. A revised edition was published by Gallaeus in 1689.

Sicilian Vespers (*sĭ-sĭl'ĭ-ạn vĕs'pẽrz*), the name of a famous insurrection against the French in Sicily, which began on Mar. 30, 1282, at the signal of the vesper bell on Easter Monday. Sicily and Naples had been conquered by Charles of Anjou, brother of Louis IX of France, but his severe and oppressive rule greatly displeased the people. They applied in vain for relief to the pope, but at length King Pedro of Aragon undertook the conquest of Sicily and took advantage of the proposal to surprise the French occupants at the ringing of the vesper bells. The inhabitants of Palermo rose against the French at the appointed signal, while other towns soon followed, resulting in the overthrow of the French and the transfer of the island to the Spanish. Fully 8,000 men, women, and children were massacred.

Sicily (*sĭs'ĭ-lȳ*), an island in the Mediterranean, the largest and most populous tract of land in that sea. Divided into nine provinces, it belongs to Italy, from which it is separated by the Strait of Messina, a channel only about 2 m. wide. The island is triangular in form and has an area of 9,926 sq. m. On the northern coast are the important gulfs of Palermo and Castellamare and on the eastern is the Gulf of Catania. The coasts of these inlets are quite steep, but the southern coast is generally flat and quite regular. The surface is diversified with mountain ranges apparently extending from the southern part of Italy, reaching heights from 4,000 to 6,000 ft., but Mt. Etna, in the eastern part, has an elevation of 11,870 ft. above sea level. Orange groves, vineyards, and mulberry gardens cover the mountain slopes, while forests abound in the higher altitudes. The valleys and plains bear wheat, maize, flax, cotton, hemp, corn, tobacco, oats, barley, and vegetables.

The climate of Sicily is healthful, especially in the Mt. Etna region, which is densely populated, although it is exposed to earthquakes and volcanic eruptions. Fogs prevail along the coasts in the autumn and the summer heat is quite intense. Rainfall is abundant for the production of cereals and fruits, and snow and ice are of rare occurrence, except on Mt. Etna. Among the fruits are oranges, lemons, dates, almonds, figs, olives, grapes, and pomegranates. It has a corresponding production of dried fruits, cereals, and wines, as well as a large output of sulfur. The principal manufactures are wine, macaroni, soap, earthenware, dairy products, cotton and silk goods, clothing, sugar, hardware, and ma-

SICILY THE TEMPLE OF SEGESTA

Begun in the second half of the 5th century B.C., this temple was never finished (the Doric columns, for instance, are not fluted). Segesta, a colony of Greece, was the prize in wars between Athens and Syracuse and between Carthage and Agrigentum (Akragas)

chinery. Sardine and tunny fisheries take a high rank. The domestic animals include cattle, horses, swine, sheep, and poultry.

Sicily has a large export and import trade, mostly with Italy, but also with other European countries and Northern Africa. Railroad building has made rapid progress. At present the island has about 500 m. of railways in operation. The principal seaports are Palermo, Messina, and Catania. The rural population is still for the most part illiterate, and brigandage and the vendetta, depicted in "Mateo Falcone" and other tales of Prosper Mérimée, are still found. Palermo, the capital, is much the largest and most important city of the island.

HISTORY. Archeological relics found in Sicily form a picture of the successive periods of the island's domination by foreign peoples and empires: remains of Sicanian and Siculan tombs, Greek temples and theaters, Roman amphitheaters and aqueducts, and many examples of Byzantine, Saracen, and Norman architecture. Two classes of people, known as the Iberian Sicani from Spain and the Siculi from Italy, were the earliest inhabitants of Sicily, but they were pressed toward the interior by colonies of Phoenicians and Greeks. The cities of Messina, Syracuse, and Agrigentum were founded by the Greeks in the 8th century B.C. These Greek settlements became so powerful that the Phoenicians were driven to the western part, and Greek art, literature, and industry attained a preponderance of influence in the island. In the early part of the 5th century B.C. the Carthaginians became a powerful influence in conjunction with their kinsmen, the Phoenicians, and a prolonged struggle finally ended in favor of the Greeks in 480 B.C., in which the Carthaginian commander, Hamilcar, was slain. Hannibal next led an army of Phoenicians and Carthaginians against the Greeks, and the First Punic War gave a part of Sicily to the Romans. In 212 B.C. the entire island became a Roman province. After the decline of Rome, Sicily was invaded by the barbarian tribes from the north, the Vandals conquering it in 440 A.D. The Goths under Theodoric had possession of Sicily until 535, when it became a part of the Byzantine Empire. The Saracens conquered it in 827, holding possession for more than a century, but they were finally driven from the island by the Normans under Roger de Hauteville. His son assumed the title of King of Sicily and Italy as Roger II in 1130, calling his dominion the Kingdom of the Two Sicilies.

The *Two Sicilies* included the island of Sicily, the kingdom of Naples, and a number of islands in the Mediterranean. The line of kings became extinct in 1189 and Henry VI of Germany, of the house of Hohenstaufen, secured the kingdom by virtue of his marriage to Constantina, daughter of Roger II. The crown remained with the German emperors until 1264. Pope Urban IV bestowed the sovereignty on Charles of Anjou, brother of Louis XIV of France, in the latter year. A long contest for the throne followed. It ended favorably to the French and brought about the execution of the legitimate heir, Conradin of Swabia, in 1268. Sicily was freed from the French by the aid of King Pedro of Aragon in 1282, the contest being known as the *Sicilian Vespers,* and a separation from Naples took place, the latter coming under the Angevin dynasty and Sicily under the kings of Aragon.

Sicily remained in possession of the Aragonese sovereigns until 1505, when it was placed under Spanish dominion in the persons of Ferdinand and Isabella. Ferdinand also secured possession of Naples, and both countries remained under Spanish dominion until the War of the Spanish Succession in 1700-13, when Sicily was given by the Peace of Utrecht, in 1713, to the Duke of Savoy, and Naples became a part of Austria. In 1720 Sicily also was annexed to Austria. The Two Sicilies remained under Austrian dominion until 1734, when both Sicilies were annexed to Spain. They were a Spanish possession practically all the time until 1860, the only exception being the brief French rule in Naples from 1806 to 1815 under Joseph Bonaparte. Garibaldi gave rise to a revolution in 1860, taking Palermo on May 11 of that year and following his successes on the island with an invasion of southern Italy. He met little opposition, the people rallying to his standard, while Francis II fled from Naples. At that time the Two Sicilies ceased to exist as a government by that name, and both joined in the new Kingdom of Italy (1860) under Victor Emmanuel. In World War II, German-occupied Sicily was attacked by an Allied offensive in the summer of 1943, the Eighth Army landing with U.S. and Canadian troops in Sicily on July 10. By August 12 evacuation of Axis powers began on a large scale, and by August 17, the Allies took control of Sicily. Population, *ca.* 4,250,000.

Sickles (*sĭk′k′lz*), DANIEL EDGAR, soldier, born in New York City, Oct. 20, 1825; died May 3, 1914. He studied in the City of New York, was admitted to the bar in 1844, and three years later entered the state legislature. In 1853, he was appointed secretary of the American legation in England. He was elected to the state senate in 1855, served in Congress, 1857-61, and entered the Union army at the beginning of the Civil War as colonel of a regiment organized in New York. He commanded an army corps in the Battles of Chancellorsville and Gettysburg, losing a leg in the last named. From 1865-67 he commanded in the second military district, with headquarters at Columbia, S.C., and retired from the army in 1869. In the same year, he became U.S. minister to Spain. He resigned that position in 1873 to become president of the state board of civil service commissioners in New York. In 1887, he was made commissioner of immigration, became sheriff of New York County in 1890, and was elected a member of Congress in 1892.

Courtesy British Information Services, N. Y.

MRS. SIDDONS

Painting by Thomas Gainsborough (1727-1788)

Siddons (*sĭd′ŭnz*), SARAH, actress, born in Brecknock, Wales, July 5, 1755; died in London, England, June 8, 1831. She was the eldest of 12 children of Roger Kemble, who was the manager of a company of strolling players, thus giving her familiarity with the stage from an early age. In 1772, she married Mr. Siddons, a member of her father's company, and in 1775 appeared as *Portia* in "The Merchant of Venice," at the London Drury Lane Theater, but was not re-engaged at the close of the season. She appeared at Drury Lane a second time in 1782 as *Isabella* in "The Fatal Marriage," and met with a most enthusiastic reception. For 10 years she held first place among the actresses of England, retiring from the stage in 1812, but subsequently gave public readings from Milton, Shakespeare, and other authors. Her greatest successes were as *Lady Macbeth* and as *Queen Catherine* in "Henry VIII."

Sidereal Time (*sī-dē′rē-ạl tīm*), a measured portion of duration, based upon the apparent motion of the stars. A sidereal year consists of 366.2563612 sidereal days. The sidereal day contains 23 hours, 56 minutes, and 4.098 seconds. See also *Day.*

Siderosis (*sĭd-ẽr-ō′sĭs*). See *Occupational Diseases.*

Sidney (*sĭd′nĭ*), county seat of Shelby County, Ohio, 40 m. N. of Dayton. It is on the Miami River, the Miami & Erie Canal, and the Cleveland, Cincinnati, Chicago & St. Louis and the Cincinnati, Hamilton & Dayton R.R.'s. The surrounding country is fertile. Among the chief manufactures are machine tools, refrigerators, aluminum ware, paper boxes, leather and meat products, and castings. Sidney was laid out in 1820 and incorporated in 1834. Population, 1940, 9,700; in 1950, 11,491.

Sidney, ALGERNON, statesman, born in Kent, England, in 1622; executed Dec. 7, 1683. He was elected to Parliament in 1645, became governor of Dublin in 1646, and for distinguished services received the thanks of the House of Commons in 1647 and became governor of Dover. Though approving the execution of Charles I, he did not sign the warrant, and after the restoration of Charles II cast his influence with the party against the crown. In 1660 he was sent on a mission to Sweden. Soon after, he settled at Hamburg, Germany, because of opposition to him by the English court party, but in 1677 obtained permission to return to England. There he became implicated in political intrigues and was a warm friend of William Penn, whom he assisted in preparing the constitution of Pennsylvania. He was charged with being implicated in the Rye-House plot, a scheme for murdering the king, and, after a trial that brought forth no material evidence against him, was declared guilty and executed along with several others. Among his writings are "Discourses Concerning Government," "Letters to Henry Savile," "Apology," and "Essay on Virtuous Love."

Sidney, SIR PHILIP, courtier and author, born at Penshurst, England, Nov. 29, 1554; died Oct. 7, 1586. He was the son of Sir Henry Sidney and entered Oxford Univ. in 1569. He became a special favorite of Queen Elizabeth, largely through the influence of his uncle, Robert Dudley. Elizabeth sent him on an embassy to the court of Vienna in 1576, but he lost her favor for a time by opposing her proposed marriage with the Duke of Anjou and defending his father in his differences with the queen. His first writings were made public in 1580, when he published a romance entitled "Countess of Pembroke's Arcadia," a work full of the spirit of chivalry. In 1585 the queen appointed him governor of Flushing. He immediately proceeded to The Netherlands and at once became implicated in the war waged by Spain against Holland. While commanding The Netherlands cavalry at Zutphen, on Sept. 22, 1586, he received a mortal wound and died shortly after at Arnhem.

His fame in literature rests upon his "Defense of Poesy," a work in which he set forth the worth of the poet against the doctrine of the radical Puritans of that day, who were inclined to denounce whatever contributed to the taste for the beautiful. Another work of considerable merit is his "Astrophel and Stella," a collection of sonnets. It was among the first works of this kind to be published in the English. In 1725 his "Complete Works" were published in London.

Sidon (*sī′dôn*), or ZIDON, an important city of ancient Phoenicia, on the eastern coast of the Mediterranean, about midway between Tyre and Beyrout. It occupied an imposing site between Mt. Lebanon and the sea, and its importance was such that the entire region surrounding it was commonly spoken of under its name. It is thought that the city was founded in 1600 B.C. and that its greatest prosperity was from 1600 to 1200 B.C. For 350 years it was the principal city of Phoenicia, extending its colonies and commerce to all the lands of ancient times. The city was able to withstand the assaults of the Israelites under Joshua, and never came wholly under the dominion of the Jewish nation. At length it was conquered by Tyre, but under the Assyrians, Persians, and Chaldeans retained local independence. At the time Alexander the Great invaded Syria, in 333 B.C., it enjoyed much prosperity and willingly surrendered to that conqueror. Subsequently it lost prestige under the Syrians and Romans, and in the Middle Ages was taken by the Crusaders. The site of this renowned city is occupied by Saida, a seaport of considerable enterprise. It has manufactures of cotton and silk textiles, glass, dyes, and pottery, and a considerable export and import trade. Population, *ca.* 12,000.

Siebengebirge (*zē′b′n-gę-bĕr′gę*), or SEVEN MOUNTAINS, a small chain of mountains near the Rhine River, 20 m. N. of Cologne, in Germany. Rising above the main plain, the seven summits assume a natural pattern, from which they derive their name. Olberg is the highest peak (1,522 ft.), although Drachenfels is the best known. The summits of all seven are crowned with castles dating from the 12th century. Some of the peaks may be reached by specially built railways. Cologne Cathedral, in nearby Cologne, was built of stone taken from these mountains.

Siegbahn (*sēg′bän*), KARL MANNE GEORG, physicist, born Dec. 3, 1886, in Örebro, Sweden. He was educated at the Univ. of Lund and remained there after his graduation as lecturer in physics from 1911-20 and as professor of physics from 1920-23. In that year he went to the Univ. of Upsala, where he remained until 1937 when he became professor at Stockholm Univ. He has also been professor at the Royal Acad. of Science at Stockholm since 1937. Siegbahn is best known for his discoveries and investigations in X-ray spectroscopy, for which he won the Nobel Prize for physics in 1924. He is the author of "The Spectroscopy of X-Rays" (1925).

Siege (*sēj*), the location of an army before or around a fortified place for the purpose of compelling the garrison to surrender. The forces that invade a country resort to a siege not only to capture a stronghold of the enemy, but with

SIEGE OF GIBRALTAR, 1781

the additional purpose of preventing the receipt of supplies and reinforcements. Sieges are either by the army or navy and sometimes by both military and naval forces, though where ships are employed the investment partakes of the nature of a *blockade*. An assault is usually made instead of resorting to a siege, unless it is apparent the former would be impossible or result in an unusual loss of life. The besieging party usually approaches a fortified place by passages and advanced works, which cover the besiegers from the fire of the enemy. In many cases the fortified position is bombarded at intervals. Those within the fortification, in anticipation of a siege, frequently locate mines at places of approach, to be exploded by electric wires on the approach of the enemy.

The siege of La Rochelle under Cardinal Richelieu, in 1628, which covered a period of 14 months, is a notable example in the Middle Ages. The French and Spanish besieged the rock of Gibraltar for four years, beginning in 1779. The German army besieged Metz during the Franco-Prussian War, in 1870, and after a blockade of 70 days received the surrender of 173,000 men. The siege of Plevna, in 1877, was a prominent feature of the Russo-Turkish War. Modern warfare with its implication of *blitzkrieg* (lightning war) and concentrated air attacks, has largely nullified the effectiveness of the siege. However, during World War II, the Germans laid unsuccessful siege to the Russian cities of Leningrad (Aug. 1941-Jan. 1943) and Stalingrad (Summer 1942-Jan. 1943); both campaigns were notable for the staunch heroism of the defenders.

Siegfried Line (*sēg′frēd līn*), a World War II line of fortification. See *Fortifications; Germany.*

Siemens (*sē′mẹnz*), ERNST WERNER VON, physicist and inventor, born in Lenthe, near Hanover, Germany, Dec. 13, 1816; died in Berlin, Dec. 6, 1892. He studied at the Lübeck Gymnasium. Subsequently he took a course in the School of Artillery and studied engineering at Berlin, and in 1837 became a lieutenant in the army. Though actively engaged for some time in military duties, he devoted himself to the study of chemistry and physics, and invented a process of electroplating, the electric automatic recording telegraph, and the differential governor. In 1847 he discovered the use of gutta-percha for insulating subterranean conductors of marine cables, and adapted its use to submarine mines for the protection of the harbor at Kiel. In 1848 he supervised the construction of the first telegraph line in Germany, between Berlin and Frankfort-on-the-Main, and later laid a subterranean line between Cologne and Berlin.

Siemens left the government service in 1850 to devote himself entirely to scientific studies. He established manufacturing houses for electrical apparatus in Berlin, with branch offices in St. Petersburg, Vienna, London, Tiflis, and Chicago. The central establishment at Berlin became famous for the application of electricity to industrial art. Among his many inventions not named above are the dynamo, the process of polarizing relays, the Siemens alcohol meter, the pneumatic dispatch-tube system, methods for testing underground and submarine cables, the Siemens armature, and numerous others. The honors bestowed upon him include the patent of nobility by Frederick III of Germany and degrees by several universities, including that of Heidelberg. He contributed to many scientific magazines, and his writings have been published under the title of "Siemens' Collected Writings and Lectures."

Siemens, FRIEDRICH VON, engineer and industrialist, born in Menzendorf, Germany, in 1824; died in 1904. The brother of Ernst Werner and Karl W. Siemens, he participated in their industrial undertakings and contributed a number of important inventions to the long list of those developed by the Siemens organizations. He worked with his brother Wilhelm in England on many of his memorable engineering projects and perfected a regenerative smelting oven (1856).

Siemens, KARL WILLIAM, inventor, brother of Ernst W. Siemens, born in Lenthe, Germany, Apr. 4, 1823; died in London, England, Nov. 19, 1883. He studied at the Lübeck Gymnasium and in Magdeburg and Göttingen. Subsequently he took a course in engineering and electricity in the workshops of Count Stolberg. After becoming interested in various inventions with his brother, he went to England in 1843 to introduce numerous electrical appliances to public use and manage the branch establishment in London. In 1859 he became a British subject and made England his permanent home. His labors were mostly in two distinct fields, the application of electricity and the application of heat. He designed the steamship *Faraday* for cable laying, built electric railroads, and made numerous useful inventions. Among his most noted inventions are the Siemens-Martin Process (*q.v.*), the bathometer for measuring ocean depths, the hydraulic brake for preventing the recoil of artillery on warships, and several for the more successful use of the electric light. The Royal Albert Medal was conferred upon him in 1874, the Bessemer Medal in 1875, and he was knighted in 1883. He published "The Conversion of Heat into Mechanical Effects," "Increase of Electrical Resistance in Conductors with the Rise of Temperature," and "Regenerative Steam Engine."

Siemens-Martin Process (*sē′męnz-mär′tĭn prŏs′ĕs*), a steel-making process, which consists of the use of gas flames burning under a reflecting or reverberatory arch to heat a charge of iron to be purified. The controlled atmosphere and reaction of the slag permits the production of steel of specified quality. Heat is recovered, by the use of regenerative checker-brick recuperators, and this heat is imparted to the next cycle of gas being burned.

Siena (*sē-ä′nȧ*), or SIENNA, a city of Italy, in Tuscany, 58 m. s. of Florence. It occupies a site on three hills, has narrow and tortuous streets, and is surrounded by a wall. A railroad connects it with Florence, Pisa, and other cities. It is surrounded by a fertile country, which produces fruits, cereals, and dairy products. Among the larger structures is a Gothic cathedral dating from the 13th century, which contains fine frescoes of scenes in the life of Pope Pius II and sculptures by Donatello and other noted artists. Other noteworthy buildings include the university, the Church of San Giovanni, the Oratorio of San Bernardino, the institute of fine arts, the public opera, several Gothic palaces, a number of convents and the university, founded in 1300. Among the manufactures are lime, hats, clothing, olive oil, cotton and woolen fabrics, earthenware, and musical instruments. Though founded by Julius Caesar, it contains no remains of antiquity and appears to have obtained its greatest importance in the Middle Ages, when it had about 200,000 inhabitants. Siena produced a school of artists which flourished during the 13th and 14th centuries, and which included Guido, Simone Martini, and Baldassare Perruzzi. Population, *ca.* 50,000.

Sienkiewicz (*shĕn-kyä′vĭch*), HENRYK, novelist, born at Wola Orkzejska, Lithuania, in 1846; died Nov. 16, 1916. He attended the gymnasium and later studied philosophy at the university of Warsaw. In 1872, he made his literary debut by publishing "Nobody Is a Prophet in His Own Country," a humorous story that gained considerable circulation. He visited the U.S. in company with Madame Modjeska in 1876 and for some time resided in California, where he planned a colony for Polish immigrants. While there he corresponded to the *Polish Gazette,* a periodical at Warsaw, signing the letters *Litwos.* His eminence as an author is based upon "Quo Vadis?" (*q.v.*), published in 1896. Many of his writings deal with Polish history. He was exiled from Russia in 1905 because of his support of the revolution. He was awarded the Nobel Prize for literature in 1905. Among

HENRYK SIENKIEWICZ

Courtesy Lick Observatory, Mt. Hamilton, Calif.

VIEW OF THE SIERRA NEVADA RANGE IN CALIFORNIA

his chief works are "Without Dogma," "Children of the Soil," and "Knights of the Cross."

Sierra Leone (*sĭ-ĕr′rȧ lê-ō′nê*), a colony of Great Britain, on the west coast of Africa. It is situated northwest of Liberia. The colony is separated from the French possessions on the north by the Great Scarcies River and has a coastline of 180 m. on the Atlantic. The total area of Sierra Leone, including the areas administered as a protectorate, is *ca.* 28,000 sq. m. The coast regions are largely lowlands, which have a hot and malarial climate, and there is a gradual rise toward the northwest to the vicinity of the Kong Mts. The exports include ginger, kola nuts, piassava, iron ore, gold, etc. Among the many crops are rice, maize, yams, pumpkins, sugar, coffee, and cotton. The region was first discovered by the Portuguese under Piedro de Cintra in 1462, who gave it its present name. The colony originated when a native king ceded (1788) to the English territory to be used as a refuge for African natives destitute in England. Later, Africans saved from slave ships were settled in the colony. Today, the region comprises a Colony and a Protectorate. Government is in the hands of a nominated executive council and a legislative council in which sit the governor and official and unofficial members, including three chiefs representing the Protectorate. Most of the schools in Sierra Leone are controlled by religious bodies, though the government maintains several, including a model school in Freetown. The area of the colony of Sierra Leone is 271 sq. m., and comprises the Sierra Leone Peninsula, Tasso Island, Banana Islands, the township of Bonthe on Sherbro Island, and York Island. The population is about 120,000. The principal city is Freetown, population, 80,000. The Protectorate (proclaimed 1896) has a population of *ca.* 1,700,000.

Sierra Madre (*sĭ-ĕr′rȧ mä′drâ*), the name generally applied to the great chain of Cordilleras, or Rocky Mts., in Mexico. They extend north into Arizona and New Mexico. The slopes toward the east are gradual, but there is an abrupt descent on the Pacific side, thus forming marked precipices and grand scenery. In these mountains are silver mines of much value. They rise to heights approximating about 10,000 ft. above sea level.

Sierra Morena (*sĭ-ĕr′rȧ mô-rā′nȧ*), a mountain chain in Spain, separating Andalusia from New Castile and forming the watershed between the Guadiana and Guadalquivir Rivers. The highest peaks rise 5,500 ft. above sea level. In these mountains are deposits of lead, quicksilver, lignite, and sandstone. They are mentioned as the scene of several incidents in "Don Quixote."

Sierra Nevada (*sĭ-ĕr′rȧ nĕ-vä′dȧ*), a chain of mountains in California, traversing the east central part of that state. It extends from S.E. to N.W. for 450 m. The highest peaks are in the southern part, including Mt. Whitney, 14,978; Mt. Tyndall, 14,386; and Mt. Lyell, 13,217 ft. Mt. Shasta, in the northern part, is 14,551 ft. above sea level. The mountain range has valuable deposits of gold, silver, and other minerals. It is penetrated by many valleys and passes. These include the Tehachapi Pass, in the south; the San Juan Pass, in the central part; and the Truckee Pass, which is traversed by the Southern Pacific R.R. to reach the valley of the Sacramento. Extensive forests of deciduous trees abound in the lower slopes and fine coniferous timber is found in the higher sections, extending to a height of 8,000 ft. Among the mountains are numerous valleys of great fertility, especially the Yosemite.

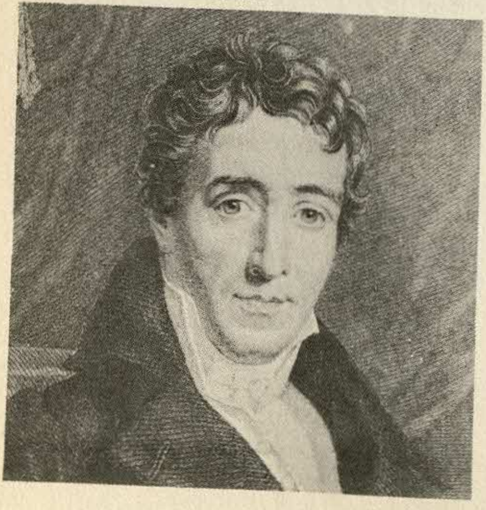
Sierra Nevada, an elevated mountain chain of southern Spain, stretching from near Cape

Gata westward into Granada. It has the highest peaks of the Iberian Peninsula. Mulahacen, 11,675 ft., is the culminating peak. Its summit is covered with snow perpetually. The scenery is picturesque and there are numerous fertile valleys and deposits of valuable minerals.

Siesta (*sĭ-ĕs′tȧ*), Spanish, meaning sixth (hour), a term which has come to signify a short nap usually taken around midday in hot countries.

Sieyès (*sē-ȧ-yȧs′*), EMMANUEL JOSEPH, COUNT, best known as Abbé Sieyès, statesman, born in Fréjus, France, May 3, 1748; died in Paris, June 20, 1836. He studied for the church at the Univ. of Paris, obtained an appointment in Brittany in 1775, and five years later was transferred to the Cathedral of Chartres. Soon after he became chancellor and vicar general of the diocese. Sieyès was extremely liberal in his views on government and issued a number of pamphlets which contributed to the revolutionary ferment then brewing in France. In 1788, during the formation of the states-general, he became noted as an outstanding champion of the Third Estate (bourgeoisie or middle class). His pamphlet, "What Is the Third Estate?" is credited with having had a strong influence in securing representation for the bourgeoisie in the states-general. In 1791, he was elected to the legislative assembly. He soon acquired marked influence in the national assembly, originating the idea of dividing France in governmental departments, arrondissements, and communes, and in the convention of 1792 voted for the execution of the king. In 1799, he suppressed the Jacobin Club and on the return of Bonaparte from Egypt entered into a league with him that culminated in the *coup d'état* of 1799 and the appointment of Napoleon as First Consul. On retiring from public service he was made a count and given an estate valued at $225,000. He was banished from France at the restoration of the Bourbons, but returned after the Revolution of 1830. He wrote a number of works on civics and economics, and drafted a new constitution for France.

EMMANUEL JOSEPH SIEYÈS



Sigel (*sē′gẹl*), FRANZ, soldier, born in Sinsheim, Germany, Nov. 18, 1824; died Aug. 21, 1902. He was graduated at Karlsruhe and entered the service of the Grand Duke of Baden. Subsequently he became involved in the Revolution of 1848 and was compelled to seek safety in the U.S., but returned to Germany in 1849 to engage in another insurrection. This enterprise failed also, and he fled to Switzerland. In 1851, he went to England and two years later came to the U.S. After teaching mathematics in New York City, he became professor in a German college in St. Louis, and at the beginning of the Civil War entered the Union army. He fought with much distinction throughout the war, captured Camp Jackson in Missouri, and rose to the rank of major general. In 1871, he was made registrar of New York City. President Cleveland appointed him pension agent for New York in 1886. He was editor for some time of the Baltimore *Wecker*, a German newspaper, and later of the *New York Monthly*.

Sigismund (*sĭj′ĭs-mŭnd*), Emperor of Germany, born Feb. 14, 1368; died Dec. 9, 1437. He was the son of Emperor Charles IV, and married Marie of Anjou, who ascended the throne of Hungary. In 1387 he was crowned King of Hungary and as such led a large army against the Turks, but was defeated at Nicopolis on Sept. 28, 1396. Soon after he conquered Serbia, Bosnia, Herzegovina, and several other regions, and in 1411 became Emperor of Germany. The religious excitement occasioned by the Hussites occurred in the early part of his reign and he is remembered for his promise to protect the life of John Huss by a safe bodyguard, but later permitting him to be burned. The Hussites opposed his succession to the throne of Bohemia and were long in open insurrection against him, but he pacified them by granting considerable political independence. Much of his time was spent in defending Hungary against the Turks; he defeated them in a decisive battle near Nissa in 1419. Sigismund was avaricious, but possessed a large intelligence and remarkable political sagacity.

Signal Corps (*sĭg′nạl ḳōr*), the branch of the U.S. Army that provides its signal communication. It develops, procures, and supplies communications, meteorological, and photographic equipment for all arms and services, with the exception of equipment required for certain installations of the U.S. Air Force.

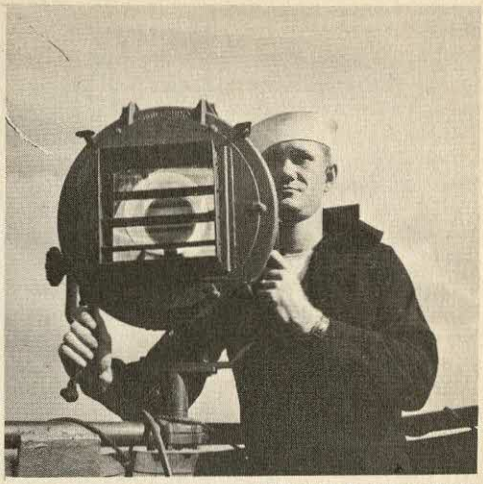
The Signal Corps also trains men in the skills required for the construction, operation, maintenance, and repair of the varied radio, telephone teletypewriter, radar, and other electronic installations; makes still and motion pictures of combat and other army operations, and produces films used in the training of army personnel.

Military signaling systems have long been used to convey intelligence beyond the range of the human voice or within range of enemy hearing. Flags, rockets, windmills, smoke—these and other methods prevailed until the middle of the 19th century, when the telegraph (*q.v.*) opened a new era. The American Civil War (1861-65) saw the rapid development of electrical signaling and its first use in battle under the direction of Maj. Albert J. Myer, originator of the "wigwag" (*q.v.*) system of signaling. The Signal Corps was organized as a separate branch of the army on Mar. 3, 1863.

Early in the 20th century radio came into limited use as a means of communication. In 1921 the Signal Corps established the first radio network, connecting the War Dept. with field installations in the continental U.S. Before World War II, the Signal Corps pioneered in the newest electronic field—radar. A radar installation developed by the Signal Corps and operated by Signal Corps technicians successfully detected the approach of hostile aircraft that attacked Pearl Harbor on Dec. 7, 1941. In January 1946, the Signal Corps made the first radar contact with the moon. During World War II, Signal Corps engineers and technicians provided the weather information vital to accurate artillery fire and to safe flying. Signal Corps soldiers strung wire lines along the new Alcan Highway and constructed a pole line in the jungles along the Burma Road.

In World War II the Signal Corps, using radio and wire circuits interchangeably, built and operated an around-the-globe belt line of semi-automatic teletypewriter installations which linked the high command at Washington with theater command networks throughout the world. Thus was it possible to co-ordinate and to direct action in battles waged simultaneously half a world apart. The Explorer (*q.v.*), launched with the help of the corps, greatly advanced guidance systems and telemetering equipment.

Signals (*sĭg′nạlz*). Signals are utilized principally in military operations and for heralding prospective changes in the weather. The first signals consisted of torches and beacon lights, which supplied information at night, while flags and other signals were employed in daytime. Ultimately an elaborate system of signals came into general use in connection with commercial navigation, and in 1902 the present international code of signals was devised. This system makes use of 27 flags. They are variously colored and arranged in groups, so that many thousands of combinations are possible.



Official U. S. Navy Photo

SIGNALING AT SEA

With shutters opening and closing, the blinker light flashes messages across the water

Each flag used in the code of signals is designated by a letter. In extremely windy weather figures of wood or iron are drawn up instead of flags, the figures used chiefly being spheres, cones, cubes, and cylinders. Signal books, explaining all the signals, are published in different languages, thus supplying a practical system for ships in international trade. Electric lights in different colors are used for long distances at night. When it is necessary to signal vessels in fogs and snowstorms, whistles or horns are blown or bells are rung.

Signals of various kinds are employed in the army and navy, thus facilitating communication between parts of the army and between warships. Signaling systems of this kind were employed from remote antiquity among the Greeks, Romans, and Phoenicians, and throughout the Middle Ages. The value of a systematic use of signals was recognized in America in colonial times. Congress authorized the purchase and equipment of signal apparatus in 1860, and after the beginning of the Civil War schools were established to give instruction in signaling.

Coastal Warning Signals: The U.S. Weather Bureau (*q.v.*) maintains over 500 coastal-warning display stations along the U.S. seacoast, the Great Lakes, and in Puerto Rico and Hawaii. Warning signals, employing flags and pennants by day and lights at night, are displayed in a coastal section when small-craft, gale, whole-gale, and hurricane warnings are issued by the Weather Bureau for the area concerned.

The weather-warning system for the U.S. and ships at sea is based on the immediate transmission of surface and upper-air weather data over national and international land-line and radio teletypewriter networks. Weather reports from several hundred observing stations are collected hourly over these networks by forecast offices throughout the U.S. Forecasts and warnings of weather conditions are issued by the forecast offices to signal display stations and local public agencies every six hours, or more frequently if needed. Weather conditions are made public via radio and television stations and the press.

Signaling was one of the earliest uses of electricity. Discovered early in the 19th century, its use became nearly universal by the 1880's. Today nearly every home in America employs at least one electric signal: the common door bell. See also *Bell*.

Where signals from several points are received in one location an annunciator is used to denote the place where the signal originated. In some annunciators, arrows point to a number denoting the location of the signal; in others a white disk appears in a numbered or lettered opening.

Signaling is generally referred to as a method of calling attention to something to follow. The bell on a telephone is a signal that someone is ready to talk. Other signals, by means of codes, convey more elaborate messages. Examples of this are the telegraph and the telegraphic fire alarm.

See also *Signal Corps,* and color plates, *Means of Communication I and II,* Volume II.

Signorelli (*sē-nyô-rĕl'lē*), LUCA, leading painter of the Umbro-Tuscan School, born at Cortona, Italy, *ca.* 1441; died in 1523. He studied painting under Piero della Francesca at Arezzo and spent much of his life in the hills of Tuscany. From 1478 to 1484 he worked in Rome, where he, like so many other leading Renaissance artists, participated in painting the frescoes of the Sistine Chapel, with a scene from the history of Moses. With the exception of some assignments in Perugia, Siena, and Orvieto, the later years of his life were spent at Cortona. Signorelli excelled in frescoes and altarpieces. Among the first, the frescoes in Orvieto, in the Chapel of San Brizio, with scenes like the Last Judgment and the Antichrist, prove his magnificent composition and treatment of the single figures. The "School of Pan" mirrors Signorelli's close connection with antiquity and his humanistic approach toward it. In his portraits, too, the same keen observation of structure becomes evident. It is only natural that Signorelli was also a master of drawing.

Sigourney (*sĭg'ēr-nĭ*), LYDIA HUNTLEY, author, born in Norwich, Conn., Sept. 1. 1791; died in Hartford, June 10, 1865. She taught women's classes in Hartford, and in 1819 married Charles Sigourney. Her first writings appeared in 1815, when she published "Moral Pieces in Prose and Verse." She contributed to some 300 periodicals. In 1841 she visited Europe, and the following year published a record of the tour under the title, "Pleasant Memories of Pleasant Lands."

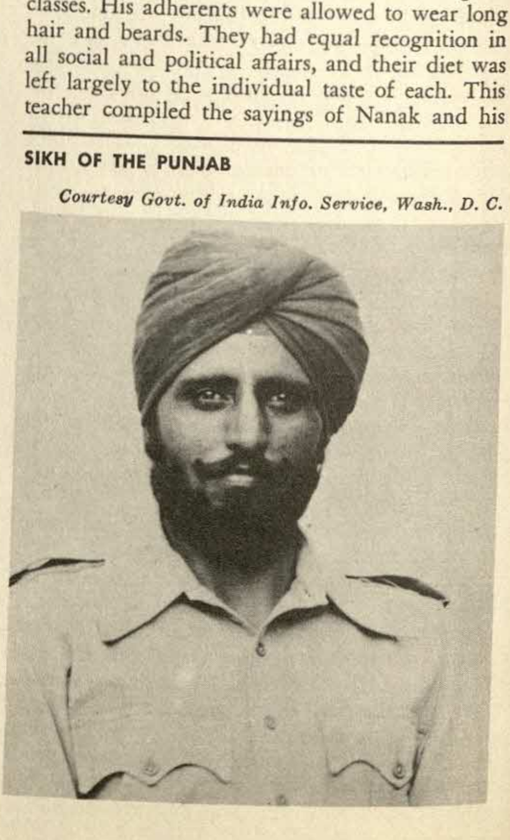
She was often called the "American Hemans," because of her varied and extensive work.

Sigurd (*zē'gŏŏrt*), the hero of the *"Volsung Edda,"* corresponding to the *Siegfried* of the German *"Nibelungenlied"* (*q.v.*). He is described as the son of Sigmund, who descended from Odin. He grew to manhood at the court of his stepfather and was given the sword of his father, who had received it as a gift from Odin.

Sikhs (*sēks*), meaning disciples, the name of a religious sect of northwestern India, whose tenets include the worship of one invisible God. It was founded by Nanak Shah (1469-1539 A.D.), who conceived the laudable plan of unifying all the Hindu castes. His preaching favored universal toleration, encouraged acts of benevolence and self-denial, and advocated equal social and political rights for all men. The Sikh state was founded by Guru Govind, the 10th teacher after Nanak Shah; Guru made his followers a military power, chiefly to defend the faith against persecutions by the Mohammedans and other religious classes. His adherents were allowed to wear long hair and beards. They had equal recognition in all social and political affairs, and their diet was left largely to the individual taste of each. This teacher compiled the sayings of Nanak and his

SIKH OF THE PUNJAB

Courtesy Govt. of India Info. Service, Wash., D. C.



immediate successors in the two works entitled "Adi Granth" and "Dasema Padshah," which he intended should supersede the "Puranas" and the "Vedas."

The Punjab became the seat of Sikh influence in the late 18th century after the decline of the Mogul empire. Ranjit Singh (*q.v.*) united the many Sikh provinces into one dominion under himself as maharajah and annexed and conquered much territory. After his death, however, the Sikh empire, the only autonomous territory left in India, came into conflict with the British government. The Sikhs were successively defeated in decisive battles in 1845-46 and in 1849 were finally conquered and their possessions annexed to British India. In 1951 the Sikh population of India was 6,200,000.

Si-kiang (*shē′jĭ-äng′*). See *Si.*

Sikkim (*sĭk′ĭm*), a protectorate of India, bounded on the N. by Tibet, on the E. by Tibet and Bhutan, on the S. by India, and on the W. by Nepal. It is a fertile agricultural region, producing rice, corn, millet, fruits, and cardamom. The chief industry is the manufacture of woolen cloth. The state religion is Buddhism, but Hinduism has many adherents. Sikkim was under British rule until 1947, after which the government of India assumed control of defense, foreign relations, and communications. The capital is Gangtok. Population (1951), 135,646.

Silage (*sī′lĭj*), also called ENSILAGE, is a feed for livestock made by storing a moist forage crop (usually green) in a silo in the absence of air. Silage making is an old process, having been used by Roman armies marching across Europe hundreds of years ago, to preserve emergency horse-food supplies in dirt-covered pits. Silage making had become an established practice in Europe as early as 1850. The first known silage was made in the U.S. in 1876. Silage is made from many crops, including corn, the sorghums, small grains, grasses and legumes used for pasture and hay, and miscellaneous crops.

The silo may consist of a pit, trench, stack, a temporary round upright silo of slatted fencing and paper or other material, or a permanent upright silo constructed of wood, concrete, brick, clay tile, asbestos staves, or steel.

Corn, the sorghums, cereals, and grass crops grown alone or with legumes and cut after heading out make excellent silage when chopped and stored in a silo alone. Legumes, grasses cut before heading out, and combinations of legumes with immature grasses are high in protein and low in soluble carbohydrates. They can be made into a good silage by wilting slightly in the field to a moisture content of 68 per cent or less (68 to 55) and storing alone, or by storing the fresh green crop with additions of dried chopped hay (to reduce moisture content), ground dried grains, molasses, phosphoric acid, or A.I.V. acids (hydrochloric and sulphuric acids). Crops ensiled by the wilting process must be chopped finely (setting the cutter for a ¼-in. cut) and 4 to 6 ft. of heavy wet crop must be run in on top to provide weight and pressure for forcing the air out of the drier crop below.

In the U.S., wilting, or additions of ground grains, molasses, or phosphoric acid, are preferred for making silage from legumes and immature grasses. Such silages are high in nutritive value and vitamin A, and greatly increase the vitamin A content of milk when fed to cows. In northern Europe most silage is made from grasses and legumes and the A.I.V. method of adding sufficient hydrochloric and sulphuric acids to bring the pH (degree of acidity or alkalinity) of the green crop down below 4.0 is widely used, particularly in Finland, Denmark, and Norway. This process, developed by Artturi I. Virtanen, reduces enzyme and bacterial action in the silo and reduces storage losses of feed nutrients and vitamin A, but produces an unpalatable silage.

Silas Marner (*sī′lạs mär′nẽr*), a novel by the English novelist, George Eliot (Marian Evans, *q.v.*), published in 1861.

Silenus (*sī-lē′nŭs*), in classical mythology, the son of Hermes or Pan and the companion of Dionysus. Originally he was the god of flowing water, but later came to be regarded a jovial, full-bearded man with a tendency to become intoxicated.

Silesia (*sī-lē′zhạ*), in German, SCHLESIEN, a historical region of east central Europe, now in Polish and Czechoslovak territory. Until early in the 20th century the greater part of the region (now under Polish jurisdiction) was German, comprising the Prussian provinces of Upper and Lower Silesia; the smaller part (now in Czechoslovakia) constituted Austrian Silesia.

Lying in the valley of the Oder River, Silesia is a rich agricultural region with an important timber industry and pasturage for livestock. Its southern part has extensive and highly exploited mineral deposits, including coal, lignite, iron, and lead. This area also is highly industrialized, its major products including iron, steel, textiles, and chemicals.

Silesia has been a pawn in the political struggles of Europe for many centuries. It was occupied by Germanic tribes at the beginning of the Christian era, but by the 6th century A.D. Slavonic tribes had settled in the region. By the 10th century it had become part of Poland. In the 13th century it was divided into a number of small states, which, in 1526, were annexed to Austria. Conflicting claims to Silesia continued throughout the 16th and 17th centuries, culminating in the Silesian Wars of 1740-42 and 1744-45 (which actually were part of the larger

Courtesy Metropolitan Museum, N. Y.

SILHOUETTE

By Augustin Edouart (1788-1861)

War of the Austrian Succession, *q.v.*) and the Seven Years' War (*q.v.*). In 1740 Frederick II of Prussia laid claim to Silesia by virtue of a pact dating back to 1537, under which the Polish duke of Liegnitz, of the Piast dynasty, agreed that the elector of Brandenburg should receive sovereignty over Silesia if the Piast dynasty should become extinct. The War of the Austrian Succession won most of Silesia for Frederick, and in the Seven Years' War Maria Theresa of Austria unsuccessfully tried to regain the territory. This division of Silesia remained in effect until after World War I, when the treaty of Versailles (1919) gave parts of Upper and Austrian Silesia to Czechoslovakia; a plebiscite (1921) gave another part of Upper Silesia to Poland. In 1927 the rest of Austrian Silesia became part of Czechoslovakia, but it was seized by Poland in 1938 and by Germany in 1939. During World War II Silesia was heavily bombed; it was captured by Russian troops in 1945. The Potsdam Conference awarded Upper and most of Lower Silesia to Poland; the remainder of Lower Silesia was placed under Polish jurisdiction by the U.S.S.R. Under the terms of the conference, the German residents of the territory were transferred to Germany, most of them sustaining loss of homes and property.

Silhouette (*sĭl-ōō-ĕt′*), a form of portraiture which shows the profile view with the outlines filled in in black. This form of art became popular in Paris, France, about 1750. Its name is derived from that of Étienne de Silhouette, French minister of finance, whose reputation for being parsimonious garnered him the dubious honor of having his name tied with anything incomplete.

Silica (*sĭl′ĭ-kȧ*), the dioxide of silicon (SiO_2). The substance is very widely distributed in nature. Quartz is pure silica and sand is an impure variety. Impurities fused in quartz give special properties. Traces of iron in quartz produce amethyst, organic materials give smoky quartz and agate, jasper and onyx arise from the presence of ferric oxide.

Silica is a highly refractive substance (melting point, 1,710° C.) and is quite insoluble in water. It dissolves in sodium hydroxide solution, producing water glass (sodium silicate) and in hydrofluoric acid, producing a volatile gas, silicon tetrafluoride, SiF_4, which escapes from the solution. The formation of this substance occurs very readily even from the silicon combined in glass, and hydrofluoric acid is therefore used to etch glass. Many plants and animals are able to deposit silica from some sort of solution or colloidal dispersion, forming skeletal structures.

Silica exists in three different structural modifications, differing from one another in density and optical properties; and they may be converted one into the other by temperature changes. Their difference in density causes a complication in the use of silica for firebricks when the latter are heated to high temperatures.

Silica has a variety of uses. Large amounts are employed in the manufacture of porcelain, glass, firebrick and silica gel. The latter material is a partially hydrated form of SiO_2 used as an absorbent for gases; it is capable of taking up enormous amounts of gases and vapors by virtue of the extensive surface exposed per gram of material. Silica gel is also used as a substrate for some catalysts. It is prepared by heating hydrated silicon dioxide $SiO_2(H_4SiO_4)$, precipitated by adding muriatic acid (HCl) to water glass (Na_4SiO_4).

Silicates (*sĭl′ĭ-kāts*), compounds of silicon and oxygen in which silicon occurs in the form of an oxygenated anion; for example, SiO_4^{-4} and SiO_3^{-2}. Silicates may be classified conveniently into two groups, simple and complex. Examples of the former are sodium meta-silicate (Na_2SiO_3) and sodium ortho-silicate (Na_4SiO_4), while examples of the latter are clays, feldspar, asbestos, mica, zeolite, and many others. The simple silicates may be prepared by dissolving silicon dioxide in alkalies or by hydrolysis (reaction with water) of silicon tetrachloride or other silicon halides. The complex silicates are naturally occurring compounds and differ from one another primarily in the nature of the anions (negatively charged ions) since practically all of them have the same metallic (or positive) ions. Feldspar (a potassium aluminum silicate) and clay are used in the manufacture of brick and in the preparation of ceramic products; asbestos is used primarily for heat insulation; mica is used for electrical condensers and electrical insulation in general; while zeolites have the unusual property of exchanging sodium ions (Na^+) for the calcium ions (Ca^{++}) of hard water and thereby softening it. Glass is a supercooled liquid composed of the silicates of sodium and calcium.

Silicon (*sĭl'ĭ-ḳŭn*), a chemical element having an atomic number of 14 and an average atomic mass of 28.06. The element is nonmetallic in nature and resembles carbon in many properties and reactions. It is never found free in nature, but is widely distributed (second to oxygen) in a variety of minerals, rocks, sand, and skeletons of biological organisms (sponge and diatomaceous earths). In the latter form it is known as kieselguhr.

Silicon is an amorphous brown powder and reacts with other elements only at high temperatures. Silicon tetrachloride ($SiCl_4$) is formed by heating silicon and chlorine, and other halogen compounds are formed similarly. Heating silicon and magnesium produces magnesium silicide (Mg_2Si). A mixture of hydro-silicon compounds such as silicone or monosilane (SiH_4), disilane (Si_2H_6), etc., analogous to the hydrocarbons by treating magnesium silicide with hydrochloric acid. These compounds and other members of the same and related series are unstable and usually burst into flame on contact with the air. Dimethyldichlorosilane [$(CH_3)_2SiCl_2$], an important waterproofing compound, is prepared by passing methyl chloride (CH_3Cl) over a heated, sintered alloy of silicon and copper. Silicon reacts readily with iron and confers acid-resisting properties on steels of which it is a constituent. Silicon reacts with sodium hydroxide to liberate hydrogen and with fluorine to form silicon tetrafluoride, a volatile compound also formed when glass is etched with hydrofluoric acid. Silicon tetrachloride hydrolizes readily in moist air containing ammonia, forming a dense white cloud of silicon dioxide (SiO_2) and ammonium chloride (NH_4Cl) and may therefore be used as a smoke screen for naval operations.

Silicone (*sĭl'ĭ-ḳōn*), an organic compound of silicon, in which aryl or alkyl groups are joined to silicon by direct carbon-silicon bonds. Aryl groups or radicals are known as "aromatic," derived from benzene or its homolog, such as phenyl, naphthyl, and anthracyl. Alkyl groups or radicals are known as "aliphatic," derived from methane or its homolog, such as methyl, ethyl, propyl, and butyl. From one to four such organic groups may be linked to the silicon atom. The term silicone also includes the possible organic group substitutions in silicon hydrides, silicon halides, and silicon esters (see *Silicon*). The silicones or organic compounds of silicon are more stable to heat and chemical attack than organometallic compounds. The basic units of the silicone structure are repeated several times to form the silicone molecule. Molecules with repeating structure units are called polymers. If an aliphatic radical is attached to the silicon atom and chemically so treated that the molecular structure contains 10 to 20 basic units, a lubricating oil results with the special property of not becoming stiff and unusable at low temperatures, and its wide temperature range of efficiency makes it valuable for use in aircraft engines which encounter extreme temperature differences. When this same organosilicon compound is so processed as to increase the number of basic units in the molecule, silicone rubber or "bouncing putty" is produced. This material is both plastic to slow forces and elastic to quick forces. It pulls like taffy, but when dropped to the floor it bounces like rubber.

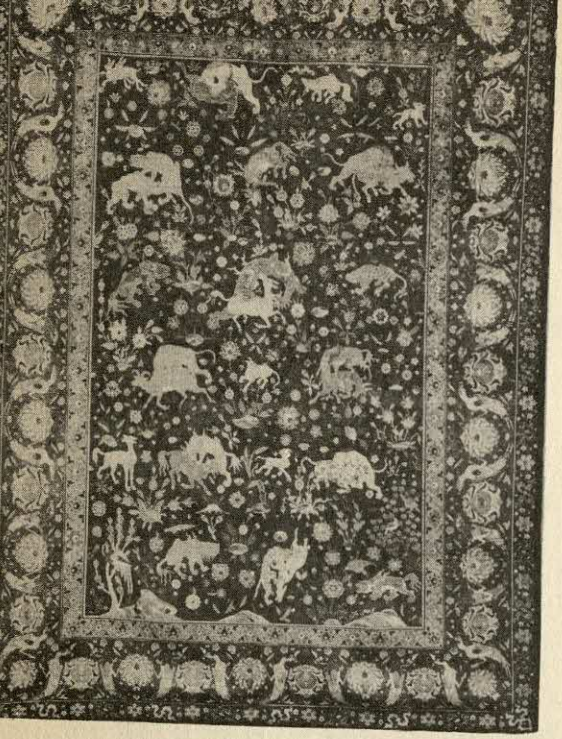
Other silicones synthesized from the chlorosilanes (see *Silicon*) form films which set thermally at 250° C. to become a flexible varnish with high heat resistance. This varnish is used to coat glass cloth or asbestos fiber used as insulation in electric motors, and such insulation permits higher operating temperatures. Silicone resins are also used as a vehicle for heat-resisting paints, and for laminated heat-resisting panels. Dimethyl silicones are used in brake fluids. Silicone lubricating oils, bearing greases, and plug-cock greases increase motor efficiency at high or low temperatures. Other silicones are useful for waterproofing fabric and paper. Methylchlorosilane vapor gives a water-repellent surface film to glass, fabrics, and parts used in electrical apparatus. The silicones are synthetic products and can be tailored to fit specific needs where the qualities of heat stability and electrical resistance are desirable in an organo-product.

Silicosis (*sĭl-ĭ-ḳō'sĭs*). See *Occupational Diseases.*

Silk (*sĭlḳ*), a delicate lustrous fiber, the only natural filament in the form of a continuous thread, several hundred yards long, is produced by numerous varieties of silk moths called Lepidoptera, or scaly-winged insects, found all over the world. There are over 400 classified species, varying in size and surface markings, all providing silk filaments, most of which, however, are of no commercial value.

Commercial silk moths may roughly be divided into two main species: (1) *Bombycidae*, or spinners, the round-winged owl moth, unknown in a wild state and from whose cocoons are reeled the better grades of raw silk, and (2) their close relatives, the *Saturnidae* family, of which over 36 varieties are found in India alone. Although very few wild moths produce cocoons equal to those of domesticated silkworms, yet they supply fibers for tussah, eri, and shantung silk fabrics.

The silk of commerce is chiefly obtained from cocoons of the domesticated Bombyx mori or



Courtesy Metropolitan Museum of Art, N. Y.

SILK RUG, PERSIA, 16th CENTURY

white mulberry silkworm. Cocoons are recovered before the fully developed chrysalis attempts to break out of its pupal nest and thus damage a filament of between 900 and 1,300 yds. long. Unlike other textile fibers, silk filaments are not cellular in structure, but are continuous cylindrical units and are therefore more durable. In comparison with its diameter, it possesses greater tensile strength and elasticity than any other natural fiber. When its outer gum, or sericin, has been removed in a hot bath, which also kills the developed chrysalis and softens the filament for reeling, the core fiber of true silk is smooth and transparent, and without any further processing than reeling, is ready to be used as a textile fiber.

Cocoons, both domesticated and wild, vary in size, shape, and color, and are normally constructed by silk caterpillars, not in the shape of a ball or sphere, but rather in a figure 8 pattern, the long filament terminating in a "floating end" inside the cocoon, when the caterpillar has exhausted its supply of fiber fluid. In their natural colors these filaments are either white or yellow, and due to the presence of a natural gum these isolated filaments permanently adhere together. The reeler locates the "floating ends" of a few cocoons, then all are simultaneously reeled as a single thread into skeins, known as raw silk, and stored for future weaving or knitting.

The reeling of silk is a hand process, and no machines have satisfactorily replaced it. Reelers must be expert in compensating for any lapse between the end of one cocoon filament and the beginning of another, as any difference in numbers of thread filaments, or even a slight variation in diameter of any of them, will produce an uneven thread, and because silk fabrics are normally sheer and finely woven any irregularity is noticeable. This factor is so important that raw silk, which apparently varies but slightly, is actually graded into nine distinct classes.

Floss, or floretta, on the outside of the cocoon, and any short or broken lengths of filament, are utilized as spun silk in the manufacture of heavier silk fabrics and as embroidery yarns and sewing thread.

Raw silk from cocoons constructed by wild silk caterpillars, which feed on varieties of castor oil plants and oak leaves, instead of white mulberry tree leaves, is called Tussah silk, and possesses less strength and reeling facility. Wild silk filaments are normally colored with shades of brown, varying from tan to darker shades.

Preliminary to weaving into cloth or hosiery, the raw silk filaments, having been thrown or twisted, are wound on bobbins, cones, or spools for future use on looms and hosiery-knitting machines. The amount of twist is determined by the purpose for which the silk thread is to be used. Crepe fabrics and hosiery require tightly twisted thread, while plain fabrics, such as taffetas, require loosely twisted thread. The firmer the surface of silk fabrics and the closer the weaving, the more luster is obtained from added light refraction, and less wear will result from surface friction or abrasion. Silk fiber is hospitable to dyes, and to finishes for a variety of fabric effects. When dye is used on silk filaments before processing into cloth, it is said to be yarn dyed, but when dying is done after the filaments have been woven into cloth, it is said to be piece dyed. Although most silk dress goods are piece dyed, taffetas and similar silk fabrics are frequently yarn dyed.

Silk is shrouded in both myth and mystery, but undoubtedly it was first discovered in China about 4,000 years ago, for both the silkworm and the mulberry trees upon the leaves of which the domestic type of silk caterpillar feeds are natives of China. According to legend, Sing-li-chi, wife of a Chinese emperor, noticed a caterpillar spin its cocoon. She designed a crude reel, and, assisted by ladies of her court, recovered enough of the silken filament to weave a robe for the emperor, who promptly accorded royal recognition to the potential new industry. The empress was made Goddess of the Silkworm, a temple was dedicated in her honor, and her feast day was celebrated each spring. Silk became a royal monopoly and for over 2,000 years the Chinese carefully guarded the source and processing of silk.

Silk culture and processing were introduced into Japan about 200 A.D., when four Chinese silk reelers and weavers were forcibly taken to that country to instruct the Japanese people in the art of sericulture. So proficient were the Japanese in the art of raising silkworms that ultimately they became the largest producers of raw silk.

Trade in raw silk and silk fabrics with Persia and India was early developed by means of overland caravans, and, especially in western Asia, it blossomed into an even wider application of the silken textile fiber. When almost incessant wars stopped the normal European traffic in silk fabrics from Asia, the Roman Emperor Justinian took steps, in 535 A.D., to develop silk culture and processing at Byzantium, then the capital of the Roman Empire. Two Nestorian monks, long residents of China, secretly brought silkworm eggs and mulberry tree seeds to that city, and soon, under royal monopoly, European sericulture rapidly flourished, and ultimately spread to Greece, Sicily, Italy, Spain, and France, each country contributing a distinctive artistry in both weaving and design. Fashion of the Renaissance was largely based on silk fabrics, brilliantly colored and exquisitely woven, and reached its peak in the 15th century, when both French and Italian silk designers and weavers vied with each other in textile artistry. Silk culture was introduced into England in the 14th century, and was greatly strengthened when French silk craftsmen, mostly Protestants, were forced to emigrate from their homeland by the revocation of the edict of Nantes.

Silkworm culture was introduced into colonial America in 1622, at Jamestown, Va., under patronage of James I of England, but was not successful, although as the art spread to Georgia, and to New England, it was spasmodically developed either under pressure or by promise of bonus payments. Spectacular instances, such as American raw silk used for the robe of an English queen, and Mt. Vernon-grown silk for an inaugural dress of Martha Washington, focused the public eye on a potential American industry, but the U.S., though the largest processor of raw silk and largest consumer of silk products, has never been seriously interested in cultivating either the silkworm or the mulberry tree.

About 1836 a new type of Chinese mulberry tree, the *Mori Multicaulus*—or "many purpose" —was introduced into the U.S., and so easy was this white mulberry tree to cultivate that American farmers and even small storekeepers looked upon silk culture as the easy road to fortune. Promoters sold silkworm eggs and multicaulus seed and cuttings at exorbitant prices, for they promised farmers that all they had to do was to sit back and harvest cocoons. Soon, however, the bubble burst, for raw silk production begins with the cocoon crop, while the majority of the farmers sought their profits in resale of multicaulus trees or clippings at prices higher than even the high prices they themselves had paid.

About 1824 the first American silk thread reeling mill was established at Mansfield, Conn., and in 1838 the first silk fabric mill was erected at Paterson, N.J., soon to become the silk-manufacturing center of the U.S. After 1865 the manufacturing of silk cloth, handkerchiefs, and ribbons rapidly increased, because a protective tariff placed upon imported silk products offered the home industry a favorable start. In 1860 only 13 per cent of the silk products consumed in the U.S. were of local origin; by 1880 this volume had almost doubled, and in 1939 over 85 per cent of the silk products used in this country were of local origin. Imported silk fabrics have mainly been confined to printed silk fabrics from France, and to necktie fabrics from Italy and England.

As a fabric for fine dress fabrics, raw silk became less important in the U.S. after rayon (*q.v.*), formerly called artificial silk, was developed and marketed in sufficient volume to satisfy textile requirements, and, although imported raw silk was still used for hosiery, yet in 1939 only 4 per cent was consumed in woven fabrics. American imports of raw silk ranged from 1,340,000 lbs. in 1871, at an average price of $4.77 per lb., to the high volume point of 98,016,000 lbs. in 1929, at an average price of $4.41 per lb. The highest reported dollar pound price for raw silk was $6.48, which was paid in 1923. The last complete importing year was 1940, when 47,000,000 lbs. of raw silk were purchased in the U.S., at an average price of $2.65 per lb.

Ever since the close of the Revolutionary War, raw silk production, or sericulture, has periodically been attempted in the U.S. When, in 1941, because of outbreak of war, importation of raw silk ceased, a renewed effort to produce natural raw silk was made, not only in the U.S., but also in South America, but in no instance has proof of satisfactory production on a commercial scale been forthcoming. Raw silk is distinctly a natural product of countries where favorable climate is combined with an adequate supply of low-cost, semiagricultural labor, and for this reason silk culture has been the least mobile of all natural textile fibers, and still remains the ideal product of Asia.

While the silk moth cocoon and its propagation would present no difficult problem to modern scientists, yet no important technology in sericulture has been made to improve ancient Chinese procedures which seem to have been correctly solved in the dim past, and which, for over 2,000 years, were successfully kept secret, at considerable profit for the ingenious Chinese sericulturists. See also *Nylon; Rayon.*

Silkworm (*sĭlk′wûrm*), the larva of a moth

Courtesy National Federation of Textiles, N. Y.

SILKWORMS SPINNING A COCOON

that produces a dense silken cocoon of value commercially. The silkworm cultivated almost universally came from northern China, being a moth of the family *Bombycidae,* but there are about 400 species, though some are not valuable in silk culture. The body of the silkworm is thick and hairy. In a mature state it is about 1 in. long and has stout legs, and the large wings are marked with dark lines. The body of the female is larger than that of the male, and both die soon after the female deposits its eggs. These are about the size of a mustard seed and are fastened to the leaf of a mulberry tree, or some other object, by a gummy substance. The eggs may be kept a long time in a dry, cool place. They hatch soon after coming into a warm place, and the young insects feed with remarkable greed on the leaves of the mulberry tree. They remain in the caterpillar state from six to eight weeks, in which time the skin changes four times, and the body finally assumes an ashy color and a length of nearly 3 in. In the body are 12 segments, six anterior or forelegs, 10 fleshy legs in the hind part of the body, and a large mouth.

The young insects stop eating about the fifth week and find a suitable place to spin their cocoons, which they prepare from silk threads produced by their own bodies. These threads are made from a glutinous substance secreted by two tubular glands near the mouth, one on each side of the body, the gum being drawn through a single tube at the upper lid and spun into silk. In this way the thread of silk is made to consist of two strands and varies in length from 900 to 1,300 yds. From three to five days are required to complete the cocoon, and after finishing it the insect assumes a waxy-white color and soon forms the second stage of life, or the pupa state. In this pupa or chrysalis stage it remains about three weeks, when it emerges as the imago, or perfect moth. Insects designed to supply silk material are not allowed to develop into the perfect moth, but are thrown into warm water and killed, while the silken threads are unwound and used in the manufacture of threads and fabrics. The moth produces from 300 to 500 eggs. One ounce of eggs produces 100 lbs. of cocoons, while 12 lbs. of cocoons yield 1 lb. of raw silk. Among the conditions necessary for successful silk culture are pure air, warmth, and suitable food. Thrifty mulberry trees are essential, the most valuable being a species of the white mulberry. The annual production of raw silk in the world is estimated at 85,500,000 lbs. See also *Silk*.

Silkworm Gut (*sĭlk′wûrm gŭt*), a material prepared from the viscid secretion found in the body of a young silkworm, immediately before it begins to spin the cocoon. The insect is submerged in vinegar for several hours, and the substance is then extracted from the dead body. By soaking in a caustic solution the thread becomes loosened and may be removed easily. It is used for the manufacture of *gut,* which is employed extensively in making lines for anglers.

Sillanpaa (*sĭl′làn-pă*), FRANS EEMIL, author, born Sept. 16, 1888, in Hämeenkyrö, Finland. He studied natural science at the Imperial Alexander Univ. in Helsinki and afterward began to write short stories and articles for which he had already become well known by the time his first novel, "Life and Sun," was published in 1916. This volume won instant acclaim, and his second novel, "Meek Heritage" (1919), a story of the Finnish Civil War which was raging at that time, gave him the unquestioned reputation of being Finland's most important writer. In 1920 he was awarded a pension by the government so that he might be enabled to devote himself to writing without financial worry. Of his six novels, only two, "Meek Heritage" and "The Maid Silja" (1931), are available in English. He is also the author of several collections of short stories. He won the Nobel Prize for Literature in 1939.

Silliman (*sĭl′ĭ-mạn*), BENJAMIN, author and physicist, born in Trumbull, Conn., Aug. 8, 1779; died Nov. 24, 1864. He was graduated from Yale Coll. in 1796 and was admitted to the bar in 1802. Soon thereafter he became professor of chemistry at Yale, remaining there for many years. Besides taking advanced work in Philadelphia, he visited Great Britain, Holland, and other European countries to pursue study in physical sciences. In 1807 he took part in a geological survey of Connecticut, observed the fall of meteors, and invented a compound blowpipe. He founded the *American Journal of Science and Arts* in 1818.

He was succeeded at Yale by his son, BENJAMIN SILLIMAN. The latter was born in New Haven, Conn., Dec. 4, 1816; died there June 14, 1885. He was graduated from Yale in 1837 and was professor there from 1854 to 1885. He published "First Principles of Chemistry," "Progress of Science and Mechanism," and "American Contributions to Chemistry."

Silo (*sī′lô*), a watertight, airtight storage structure, in which fodder, grain, or other food is stored green to be preserved. It is derived from the Greek *siros,* meaning "a pit for corn"; from this stems the English word *ensilage,* meaning "to store in a silo for preservation." Usually cylindrical in shape, silos may be constructed of wood, concrete, brick, or other materials. The term may also refer to a lined pit in the ground used for the same purpose. See also *Silage.*

Silurian (*sî-lū′rĭ-ạn*), a system of rocks deposited during the early part of the Paleozoic era. In stratigraphic sequence it follows the Ordovician system and in turn is followed by the Devonian system. The name Silurian was taken from the Silures, a Celtic tribe that once inhabited the portion of western England and eastern Wales in which occur the rocks to which Murchison first applied the name. As originally defined by Murchison, the Silurian included two divisions, the Upper Silurian and the Lower Silurian. The present use of the term, however, has been restricted to Murchison's Upper Silurian and his Lower Silurian has been raised to the rank of a system and named the Ordovician. Silurian rocks are found in all continents. In North America outcrops of the Silurian rocks occur mainly in the eastern and northern part of the continent. In New York a band of more or less continuous outcrops extends across the state in an east-west direction just south of Lake Ontario, trends northwestward across Ontario, and may be traced in a continuous belt along the southern border of the northern Michigan Peninsula and eastern Wisconsin to Illinois, Indiana, and Ohio. Outcrops of Silurian rocks, some of which are topographically prominent, occur in the Appalachian region from southeastern New York to Alabama. In addition to these areas, Silurian beds are known in Arkansas, Oklahoma, Missouri, and Iowa. They occur also in eastern Canada and Newfoundland, and southwest and north of Hudson Bay. The Silurian formations consist of conglomerate, sandstone, shale, limestone, and dolomite. The beds of conglomerate and sandstone are mostly restricted to the Appalachian region, where they form great mountain ridges. The limestones and the dolomites are widely distributed in the continental interior. Fossils found in these rocks indicate that seaweed (algae) was abundant, and also that invertebrate animals such as corals, echinoderms, and brachiopods increased markedly over the previous period. The chief economic products of Silurian rocks are salt, gypsum, natural gas, and iron ore.

Silver (*sĭl′vẽr*), a precious metal. It is found in the native state and in combination with many other elements, among them gold, sulphur, arsenic, antimony, chlorine, lead, and copper. Early writings make it certain that silver was known to the ancients as early as gold. This is due probably to the fact that silver is often found in the natural state with gold, and that both may be melted at a low heat. Pure silver is a brilliantly white metal and is notably malleable and ductile. It is softer than copper, but is harder than gold, and takes a fine polish. Silver may be beaten into sheets of less than one-thousandth of an inch in thickness, and drawn out into a wire finer than a human hair. As a conductor of electricity it excels all other metals. It has a specific gravity of about 10.46 and a density of 10.5. The melting point is about 960.5° C.

Silver does not corrode on being exposed to the air, and is therefore widely used for plating articles and in the manufacture of jewelry and tableware (see *Art*). It is employed in coinage and glass staining, in making compounds useful in photography, and in forming many alloys. When the silver ores do not contain lead, the silver is extracted by amalgamating it with mercury and driving off the latter by the action of heat. Several complicated processes are utilized in extracting silver. In all of them the silver is first converted into silver chloride, and the metal is set free from the chlorine by amalgamation. When the silver ores contain lead, it is extracted by smelting. This method is based on the affinity that silver has for lead; the latter, acting as a solvent, serves to extract the silver from baser metals united with it. Later the silver is separated from the lead by cupellation, the silver remaining intact while the lead is formed into an oxide.

Silver was secured almost entirely from regions producing it in a natural, nearly pure state up to about the middle of the 19th century; since then later discoveries of silver in combination with other minerals have led to the adoption of methods of mining and extracting that resulted in utilizing the silver ores of much lower grade than were formerly thought to be of utility. The world's supply of silver was secured chiefly from Mexico and South America before that time, but today the U.S. has achieved nearly equal importance with Mexico in the production of silver. Spain is the largest silver-producing country of Europe.

A silver area in Nevada, known as the Comstock Lode, has produced more silver than any other locality in the history of the U.S., but today its output has dwindled to insignificance. Since its discovery, other vast veins and deposits of silver have been found, including those at Leadville, Col.; Coeur d'Alene, Idaho; Granite Mountain, Mont.; Eureka, Nev.; and Kingston, N.M. Besides these are many other noteworthy deposits and mines, all containing more or less gold, iron, sulphur, and other elements in combination with the silver.

Mexico ranks first in the production of silver, producing more than any other country in the world. The most important mines are in the state of Guanajuato, and have been worked about 200 years. Much silver is produced in the Andean countries of South America, particularly Peru, and in New South Wales and other provinces of Australia. The world's output varies greatly in value from year to year, owing to the fluctuations in the price of silver.

World production of silver and production in the U.S. in representative years from the year 1935 are as follows:

Year	U.S.[1] Production (*in metric tons*)	World[2] Production (*in metric tons*)
1935	1,418.7	6,600
1940	2,124.0	8,300
1945	903.4	4,700
1950	1,316.0	5,500
1952	1,239.2	5,800
1953	1,173.7	5,900
1954	1,106.8	5,700
1955	1,134.3	5,900
1956	1,204.9	6,000
1957	1,204.3	6,200

[1] Including Alaska.

[2] Excluding U.S.S.R., Czechoslovakia, Rumania, and some small producers.

In 1933, representatives from 66 governments met in London for the World Economic and Monetary Conference and agreed to abstain from melting up and debasing silver coins, and from passing any law that might cause the world market price of silver to depreciate. On June 19, 1934, the Congress of the U.S. passed the Silver Purchase Act, which authorized the President to require all silver in the country to be delivered to the U.S. mints, if he deemed such action advisable. It also provided, among other things, that the U.S. would increase the proportion of silver in the nation's monetary stock to one-fourth the value of gold, and it authorized the Secretary of the Treasury to buy silver both in the U.S. and abroad until the 1:4 ratio is obtained.

Silver (*sĭl′vẽr*), ABBA HILLEL, rabbi, born Jan. 28, 1893, in Neinstadt, Lithuania. He came to the U.S. in childhood and was educated at the Univ. of Cincinnati and at the Hebrew Union Coll. in that city. He was rabbi of the Jewish community in Wheeling, W. Va., from 1915-17, going in the latter year to the Temple in Cleveland, O., where he subsequently remained. Long a leading Zionist, Silver became especially militant for the Zionist cause after Hitler's rise to power. He served as co-chairman of the United Palestine Appeal from 1938-43 and as chairman after 1943, as chairman of the United Jewish Appeal after 1943, and as president of the Zionist Organization of America after 1945. In addition, he served as co-chairman of the American Zionist Emergency Council with Stephen S. Wise, resigning in 1944 after a conflict with Wise, but returning to the co-chairmanship in 1945 when the Council was reorganized. He served as president of the Central Conference of American Rabbis, 1945-47. In 1946 he became chairman of the American Office of the Jewish Agency. He is the author of: "Messianic Speculations in Israel" (1927), "The Democratic Impulse in Jewish History" (1928), "Religion in a Changing World" (1930), and "World Crisis and Jewish Survival" (1941).

Silver Certificates (*sĭl′vẽr sẽr-tĭf′ĭ-ḳĭts*), a monetary unit issued by the U.S. Treasury, payable on demand in silver dollars. Congress has several times authorized the issuance of silver certificates for the purpose of increasing the currency in circulation, *e.g.*, in 1886, 1933, and thereafter.

Silverfish (*sĭl′vẽr-fĭsh*), name of an artificially bred goldfish. Also a small wingless, silvery insect found about houses, and sometimes injurious to sized papers and starched clothes. Often called the *fish moth.*

Silver Fox (*sĭl′vẽr fŏḳs*), a variety of the common fox living in the far north. Black with a silvery appearance due to many white tips on the black hair, it has a thick black bushy tail with a white tip. Fine pelts are highly valued as fur.

Silver Spring (*sĭl′vẽr sprĭng*), popularly known as the "Fountain of Youth," located near Ocala, Fla. It is a clear spring about 200 ft. wide, and about 60-80 ft. deep; it empties into the Ocklawaha River.

Simcoe (*sĭm′ḳō*), a lake of Canada, in Ontario, situated between Georgian Bay and Lake Ontario. It is 30 m. long and 18 m. wide. The surface is 128 ft. above Lake Huron, into which it discharges through the Severn River and Georgian Bay. The area is 160 sq. m. Within the lake are many islands, and fine forests occur in the vicinity. Fishing and boating are good. In winter the ice can be crossed by teams.

Simcoe, JOHN GRAVES, soldier, born at Cotterstock, England, Feb. 25, 1752; died Oct. 26, 1806. He studied at Merton Coll., Oxford, came to New England at the time of the Revolutionary War and was wounded in the Battles of Brandywine and Monmouth. He surrendered with Cornwallis at Yorktown in 1781. He was made the first governor of Upper Canada in 1791, in which office he did much to extend the influence of the Loyalists who emigrated from the U.S. In 1796, he became governor of Santo Domingo, was promoted to the rank of a lieutenant general in 1798, and was appointed commander-in-chief of India in 1806, but illness prevented him from going to Asia. Lake Simcoe and several localities in Ontario were named in his honor.

Simile (*sĭm′ĭ-lē*), a figure of speech, consisting of a word or phrase by which anything is likened to something else, in one or more of its aspects. The comparison in a simile is pointed out by certain words, such as *like* or *as*. Similes please because we are disposed to compare objects with one another, and because they embellish statements and impress them more forcibly on the mind. They should not be drawn from things which have too near and obvious resemblance to the object compared, nor from objects which present a likeness too faint and remote. *Metaphor* resembles a simile, but differs from it in that we directly substitute the action or operation of one object for that of another. The sentence, "He is the pillar of the state," is a metaphor; while, "He upholds the state, like the pillar which upholds an edifice," is a simile.

Simms (*sĭmz*), MRS. ALBERT G. See *McCormick, Ruth Hanna.*

Simms, WILLIAM GILMORE, poet and novelist, born in Charleston, S.C., Apr. 17, 1806; died there June 11, 1870. He was of Scotch-Irish descent and began to write verses at the age of eight. After clerking in a drugstore, he studied law and became a member of the Charleston bar in 1827, but soon devoted his entire time to journalism and literature. He worked for the *City Gazette* in 1828, in which he published a number of editorials against the doctrine of nullification. Many of his novels have their plot in the American Revolutionary period, and he collected and published numerous historical and pioneer incidents. His best-known writings include: "Lyrical and Other Poems," "Tricolor, or Three Days of Blood in Paris," "The Partisan," "South Carolina in the Revolution," and "The Vision of Cortez." The Univ. of Alabama gave him an LL.D. degree. He was for some years a member of the state legislature. In 1846 he was defeated by one vote for lieutenant governor of South Carolina.

Simon (*sī'mŏn*), SIR JOHN ALLSEBROOK, lawyer and politician, born in England, Feb. 28, 1873; died in London, Jan. 11, 1954. He was graduated from Oxford Univ., studied law, and became a Liberal member of Parliament (1906-18, 1922-40). In 1910, he was solicitor general; in 1913, attorney general; in 1915-16, home secretary, resigning from the latter post as a protest against conscription. After serving in World War I, he returned to Parliament and was influential in settling the general strike of 1926. He later served as chairman of the Indian statutory commission (1927-30), foreign secretary (1931-35), home secretary and deputy leader of the House of Commons (1935-37), chancellor of the exchequer (1937-40), and lord chancellor (1940-45). He was honored for his long service to his country by being created 1st Viscount of Stackpole Ellidor in 1940.

Simon (*sē-mōɴ'*), JULES FRANCOIS, statesman, writer and lecturer on philosophic and economic questions, born in Lorient, France, Dec. 31, 1814; died in Paris, June 8, 1896. He studied in his native city and at Vannes, and at the Sorbonne in Paris under Victor Cousin, whom he succeeded in 1839. Shortly after the Revolution of 1848 he was made a member of the chamber of deputies, but refused to take the oath of allegiance to Napoleon III. A leader of the Republicans, he was minister of public instruction, 1870-73. In 1875, he was made senator for life. The following year he was chosen premier, but resigned in 1877 on account of his advanced views in relation to the freedom of the press. He became permanent secretary of the Acad. of Moral and Political Science in 1882.

Simon Magus (*sī'mŭn mā'gŭs*), meaning Simon the Magician, an individual mentioned in the "Acts of the Apostles" (8:13 ff.). It appears that he flourished in Samaria about 37 A.D., where he was a person of considerable prominence and influence. At the time Philip the Evangelist came to Samaria, many of his followers were converted, and Simon Magus also consented to be baptized. When Peter and John came to Samaria to impart the Holy Ghost to the baptized by the laying on of hands, Simon was greatly astonished and offered the apostles money to invest him with a like power in conferring the gift. For this he was thoroughly rebuked by Peter, who exhorted him to repent and seek forgiveness from God.

Justin Martyr gives a much fuller account of Simon than is found in the "Acts." He states that Simon was born in Gittha, in Samaria, and that he came to Rome in the reign of Claudius. While there he gained some followers by exercising magical arts. It appears that a statue was erected to his memory in Rome, where he was not only identified with the teachings of Christ, but entered into connection with the legends of Greek origin and the worship of Zeus. Many of the stories connected with him are of uncertain origin, but it is quite well established that he introduced a system of religious worship lying between Greek and Christian worship, which long held a place among a limited number of followers. It was commonly known as Simonianism. See also *Simony.*

Simonov (*sē'mŏn-ôf*), KONSTANTIN MIKHAILOVICH, author, born in Russia in 1915. He began his writing career as a poet, working in a factory by day and studying at the Literary Institute in Moscow at night. He soon, however, gave up his factory work for writing. During World War II he served as war correspondent for *Red Star* and *Pravda,* covering the war as a writer and in addition fighting as a soldier on all fronts. He was decorated twice for his military achievements and for literary merit won the Stalin Prize three times, once for his first novel, "Days and Nights"

Courtesy Swiss Federal Railroad

SIMPLON PASS

(1945). Simonov's plays include "Fellow From Our Town," "The Russian People" (adapted for the American stage in 1942 by Clifford Odets), and "Under the Chestnut Trees of Prague." His books telling of his experiences as a correspondent-soldier are "On the Petsamo Road" (1942), "Stalingrad Fights On" (1942), and "No Quarter" (1943).

Simony (*sĭm'ô-nȳ*), in canon or ecclesiastical law, an offense defined as traffic in sacred things for profit, such as the purchase of a license to preach, or the selling of a benefice, etc. Derived from Simon Magus (*q.v.*), the word simony is used for such offenses under English statutes dating back to Edward VI and Queen Elizabeth. In the U.S. courts there is no recognition of simoniacal practices.

Simoom (*sĭ-mōōm'*), or SIMOON, a name of Arabic origin, applied to the hot, suffocating winds that frequently occur in the desert regions of Africa and western Asia. These winds are caused by ascending currents of air due to the extreme heat over the sandy surface and to the influx of colder air from all sides, thus forming movements of air similar to a cyclone. In many regions of Arabia and Africa the surface becomes heated to 200° F., thus giving it a peculiar dryness. The winds bear with them intense heat, choking dust, and even coarse gravel. They often prove destructive to animal and plant life. In some regions vast mounds of sand are transported.

Simplon (*sĭm'plŏn*), a pass in the Alps near the boundary between Valais canton, Switzerland, and Piedmont, Italy. The pass marks the boundary between the Pennine and the Lepontine Alps. The Simplon Pass, whose highest point is 6,592 ft., was made famous by Napoleon I, who constructed a military road through it in 1800-06. This road was 42 m. long by 30 ft. wide and contained several tunnels and 610 bridges. In 1898 the Simplon Tunnel was commenced between Brig, Switzerland, and Isella, Italy, and was fully completed in 1905. It is about 12 m. long and has two passageways, each containing a single railway track. This tunnel surpasses that of St. Gotthard by about 2 m. and is the longest railroad tunnel now in use.

Simpson (*sĭmp'sŭn*), SIR JAMES YOUNG, physician, born in Bathgate, Scotland, June 7, 1811; died May 6, 1870. He studied medicine at the Univ. of Edinburgh. He was the first to use chloroform as an anesthetic in 1847, and was instrumental in causing the general adoption of chloroform in medical practice. He was made a baronet in 1866, and a statue was erected to his memory in 1877. His chief writings were in the fields of obstetrics and anesthesia.

Simpson, MATTHEW, Methodist Episcopal bishop, born in Cadiz, O., June 20, 1811; died in Philadelphia, Pa., June 18, 1884. He was educated in the Pennsylvania Madison Coll. and afterward studied medicine, but entered the ministry of the Methodist Episcopal Church in 1833. In 1837, he was made professor of natural history at Allegheny Coll. Two years later he became president of the Indiana Asbury Univ., now De Pauw Univ., and in 1852 was made a bishop. He traveled widely and, in 1881, served as a delegate to the Methodist Ecumenical Council in Europe. Simpson was held in high esteem by President Lincoln and officiated at his funeral. He was editor of the *Western Christian Advocate* and wrote several books, among them "Cyclopedia of Methodism" and "One Hundred Years of Methodism."

Simpson, WILLIAM HOOD, army officer, born May 19, 1888, in Weatherford, Tex. He was graduated from the U.S. Military Acad. in 1909. Commissioned lieutenant in the same year, he rose through the grades to the rank of lieutenant general in 1943. Before World War I he served in the Philippines and in Mexico, and during the war fought in France. Afterward he spent two years in the office of the Chief of Information in Washington, and two more in command of Ft. Washington, Md. In 1928-32 he was in Washington with the War Dept. General Staff; in 1932-36 he was professor of military science and tactics at Pomona Coll., Claremont, Cal., and in 1936-40 an instructor at the Army War Coll., Washington, D.C. During World War II, he had several commands in the U.S. before being sent to England as commander of the U.S. Ninth Army in May 1944. This army fought through

Brittany and took part in the action which eventually broke the Siegfried line and enabled the Allies to drive across the Rhine in March 1945. General Simpson retired from active duty in 1946.

Simpson, SIR WILLIAM JOHN, British physician, born 1855; died, Sept. 20, 1931. Almost immediately after his graduation (1880) from Aberdeen Univ. Simpson began his medical services for the British government. At first a local health officer, he later served on many governmental commissions in various British colonies as a health officer and investigator into plague and other tropical diseases. He was also director of tropical hygiene for the Ross Institute and Hospital for Tropical Medicine.

Sims (*sĭmz*), GEORGE ROBERT, author and playwright, born in London, England, Sept. 2, 1847; died Sept. 4, 1922. He studied at the Univ. of Bonn, Germany, and became a journalist. In 1874 he began writing sketches for the *Dispatch,* and later worked for the London *Daily News.* His chief writings, published under the pen name of *Dagonet,* include a book of light verse, "The Dagonet Ballads," "Puss in Boots," and the plays, "Two Little Vagabonds" and "In Gay Piccadilly."

Sims, WILLIAM SOWDEN, American naval officer, born in Port Hope, Canada, Oct. 15, 1858; died in Boston, Mass., Sept. 28, 1936. After being graduated from the U.S. Naval Acad. at Annapolis in 1880, Sims gradually rose through the ranks until, in December 1918, he attained the rank of rear admiral. Having served as Theodore Roosevelt's naval aide and later as president of the Naval War Coll., he was placed in command of American naval operations in European waters during World War I, being considered one of the ablest naval commanders of his time. He was made full admiral by Congress (1930) eight years after his retirement. Sims was co-author with Burton Hendrick of "The Victory at Sea," which won the 1920 Pulitzer Prize for history.

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FRANK SINATRA IN AWARD-WINNING ROLE

As *Maggio* in "From Here to Eternity," in 1953

Sin (*sĭn*), in theology and philosophy, the transgression of ethical laws. Since most religions base ethical laws on metaphysical revelation, sin is also an offense against the deity. In Christianity, the sins of mankind were redeemed by Christ. The Roman Catholic Church distinguishes between mortal sins against Divine law, which are punishable eternally, and venial sins, of lesser gravity. In Buddhism, sin is purged by transmigration (*q.v.*). See also *Original Sin.*

Sinai (*sī'nī*), a mountain in Northwestern Arabia, mentioned in the Bible, which has given its name to the peninsula in which it is located.

There is some dispute over which of the peaks on the Sinaitic peninsula is actually the Biblical Mt. Sinai. Opinion is generally divided between two of the highest mountains: Jebel Serbal, in the northwest section of the range, and Jebel Musa, in the central section. Some church historians believe that Biblical Mt. Sinai was not located on the Sinaitic peninsula at all but east of the Gulf of Akabah in Arabia. Mt. Sinai is often spoken of as Mt. Horeb in the Old Testament. Although some scholars believe that there were actually two mountains, most feel that the two terms were synonymous. According to the Old Testament, Moses received the Ten Commandments and the other laws by which the Israelites were bound on Mt. Sinai.

Sinai Peninsula (*pĕn-ĭn'sû-lä*), a peninsula which juts into the Red Sea, bounded on the W. by the Gulf of Suez and on the E. by the Gulf of Akabah. The peninsula, about 230 m. long and 150 m. wide, is in two sections, a flat, arid desert in the north and a mountainous region in the south. The highest peak, Jebel Katherin, rises *ca.* 8,500 ft. above sea level, but there are three general groups of mountains, all of which cover a region that extends about 70 m. from north to south. These mountains are formed of granite, sandstone, and limestone. In many places extensive inscriptions date from the early Christian era. The famed Greek Orthodox monastery of St. Catherine, founded about A.D. 250, is located at the foot of Jebel Serbal. The monastery's library of 3,000 volumes has been microfilmed, and the Codex Sinaiticus, one of the oldest New Testament manuscripts, was discovered in the library in the late 19th century. The whole region has a peculiarly desolate appearance, but some valleys contain fine pasture lands and trees. The inhabitants are principally nomadic Arabs, who raise goats and sheep, fruits and vegetables. Industries include quarrying and oil drilling. The Sinaitic peninsula, although physically a part of Asia, is governed by Egypt.

Sinatra (*sĭ-nä'trạ*), FRANK, actor and singer, born in Hoboken, N.J., Dec. 12, 1917. He developed his own singing style without formal training, and in 1937 won a Major Bowes amateur talent contest. In 1939 he became a featured vocalist with bandleader Harry James, and later (1940-42) sang with Tommy Dorsey's band, during which time he inspired a "swoon" craze among teen-aged girls. In the 1950's he produced his own TV show and distinguished himself as a dramatic actor in such movies as "From Here to Eternity" (1953), "The Man with the Golden Arm" (1956), and "Some Came Running" (1959).

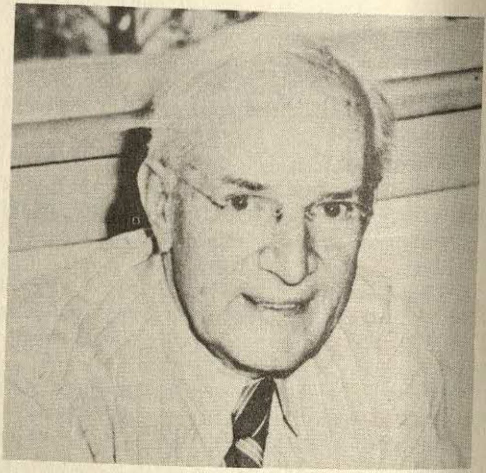
Sinclair (*sĭn'klâr*), MAY, novelist, born at Rock Ferry, Cheshire, England, in 1865 (?); died near Aylesbury, Buckinghamshire, Nov. 14, 1946. Educated at the Ladies' Coll., Cheltenham, she began to publish verse and philosophical essays at an early age. Her first successful novel was "The Divine Fire" (1904). Other works include "The Three Sisters" (1914), "Mary Olivier" (1919), "Anne Severn and the Fieldings" (1922), and a biography, "The Three Brontës" (1912). Better known in the U.S. than in England, she commanded attention particularly for her contribution to the "stream of consciousness" school of fiction.

Sinclair, UPTON BEALL, author, born in Baltimore, Md., Sept. 20, 1878. He studied in New York City at the Coll. of the City of New York and at Columbia Univ. He entered politics as a Socialist, unsuccessfully running for office several times on that party's and the Democratic tickets. In 1906 he founded the unsuccessful Utopian community, Helicon Home Colony, at Englewood, N.J., with the profits from his highly successful novel, "The Jungle" (1906). This book was instrumental in forcing an investigation of the Chicago stockyards.

His publications, devoted to the discussion of social reform, include "Mountain City," "Mental Radio," "The Brass Check," "The Goose-Step," and many others. In 1940, he began a series of novels which trace the political and social history of the period between 1914 and 1946 through the adventures of their principal character, a man named Lanny Budd. The ten books of the series include "World's End," "Dragon's Teeth" (for which he received the Pulitzer Prize), "Presidential Mission," "One Clear Call," and the last, published in 1949, "O Shepherd, Speak!"

Sindbad the Sailor (*sĭnd'băd the sāl'ẽr*), a character in the "Arabian Nights Entertainments" (*q.v.*). His adventures, based partly on tales of early navigators, somewhat resemble the earlier "Odyssey" of Homer (*q.v.*) and the later "Travels of Sir John Mandeville." Perhaps his best-known adventures are those with the huge roc (a man-carrying bird), with island-dwelling cannibals, and with the Old Man of the Sea. In this last tale, Sindbad, out of kindness, agreed to carry an apparently helpless old man on his shoulders, but then found him almost impossible to get rid of. Sindbad's adventures form a distinct work in Arabic, and seem to date from the 9th century A.D. since they refer to events of that era.

Sind (*sĭnd*), or SINDH, a province in the Dominion of Pakistan, adjoining Baluchistan. It has an area of *ca.* 48,000 sq. m. Agriculture is carried on almost entirely by means of irrigation, water being brought by canals from the Indus River. In most places the soil is sandy and alkaline, but the delta of the Indus is well watered and highly fertile. The climate is dry and there is a wide range of temperatures. Among the important crops are rice, wheat, maize, barley, hemp, opium, and tobacco. Industries include weaving, lacquer work, and the raising of animals. The inhabitants consist largely of Baluchis and Juts, a race of Hindus, and settlements of Afghans exist in the northwest. Karachi is the chief port and Hyderabad is the capital. Population, *ca.* 4,500,000.



UPTON SINCLAIR *Courtesy Viking Press, N. Y.*

Sindia (*sĭnd'ĭ-ȧ*), or SCINDIA, the name of a ruling family of India, constituting a powerful line of Mahratta princes. The rulers of this line descended from Ranoji Sindia, a native of low caste, who rose to a high rank and received as a fief half of the province of Malwa in 1743. He died in 1754.

Sinding (*sĭn'dĭng*), CHRISTIAN, composer, born at Kongsberg, Norway, Jan. 11, 1856; died in Oslo, Dec. 3, 1941. After receiving his musical training in Germany, he lived in Oslo, first as teacher and organist, later on devoting his life entirely to composition. He received a yearly allowance from his government (1890) in recognition of his work, and was awarded a life pension in 1915. For a short period (1921-22) he taught at the Eastman School in Rochester, N.Y.

He is the composer of an opera, *"Det Hellige Bjerg"* ("The Holy Mountain"), three symphonies, other orchestra works and chamber music, and piano pieces, as well as songs. His song cycle *"Heimfahrt"* ("Homeward") and his piano composition, "Rustling of Spring," are especially well known. In contrast to his countryman Edvard Grieg (*q.v.*), his compositions are somewhat less national in character.

Sine (*sīn*), abbreviated *sin*, the mathematician's expression for the ratio of two sides of a right-angled triangle in relation to one of the acute angles in the triangle. For any particular angle, the sine does not vary, and for this reason tables of the sines of angles can be published. The sine of an obtuse angle is equal to the sine of its supplement. All values of sines are pure numerics; that is, they have no units.

If one were to draw a right-angled triangle, the sine of either acute angle would be equal to the length of the side opposite the angle divided by the length of the hypotenuse, or the side opposite the right angle. The sine of an arc of a circle is the sine of the angle formed by connecting the ends of the arc to the center of the circle.

A *sine curve* (the curve obtained when the value of the sine is plotted against the angle) is a repeating curve taking the form of a wave. It is also called a sinusoid. The curve completes its cycle in 360 degrees, having positive values for the first half and negative values for the second half of the curve.

Singapore (*sĭng′ạ-pōr*), a city on the island of Singapore situated off the southern tip of the Malay Peninsula, to which it is joined by a short causeway. The area of the island is 224.5 sq. m. and of the city 31.5 sq. m. The city is in a strategic and highly favorable location for trade and shipping and serves as the main port of the Malay Peninsula and the surrounding area. In addition, it is a British naval base.

Besides shipping, the city's chief industries include the processing of rubber, tin, steel, and iron; and soap, brick, cigarettes, cosmetics, and beverages are some of the manufactures. Although the soil is not very fertile, vegetables are grown for local consumption, and considerable quantities of rubber, coconuts, and tobacco are produced on the island. The climate is hot and humid, with an average annual rainfall of 95 in.

SINGAPORE ALONG THE SINGAPORE RIVER

Native craft (*sampans*) crowd the river, many of them serving as houseboats

Little is known of Singapore prior to the 14th century, except that it is believed to have been a prosperous commercial center. About 1377 it was destroyed by the Javanese and thereafter remained almost uninhabited until 1819, when Sir Stamford Raffles founded a British settlement here. In 1824 the island was ceded to the East India Co., and the city quickly developed as a trade center. In 1867 it became a crown colony as part of the Straits Settlements. This status was maintained—except for the period of Japanese occupation (1942-45)—until 1946, when a separate colony of Singapore was created. Beginning in 1948, steps were taken to institute self-government, and in 1957 Britain agreed to establish the state of Singapore in 1958, raising it to the status of a self-governing area of the Commonwealth but subject to British control of defense and external affairs. Population, 1956 (est.) 1,261,677, including 965,274 Chinese, 153,962 Malays, and 19,416 Europeans.

Singhalese (*sĭng′gȧ-lēz*), or SINHALESE, members of the Indian-Dravidian race. Most of the Singhalese inhabit the island of Ceylon, and are Buddhist in religion. Their language is also referred to as Singhalese.

Singing (*sĭng′ĭng*), the art of uttering musical inflections or modulations of sound, to produce music with the human voice. The muscles of the chest and diaphragm are called into a complexity of action by singing, and the character of the tones is modified by the nasal chambers and the cavity of the mouth. However, the larynx, which contains the vocal cords, is of primary importance, since the length and form of the cords give pitch and some shades of quality to the voice. Air is taken in and expelled by the lungs through the muscles, and by this means sound is produced as the currents of air pass through the throat and act upon the vocal cords. No single individual is able to embrace the entire compass of the human voice, which ranges from C below the bass clef to F above the treble. Four parts are generally recognized in singing, these being the soprano, alto, or contralto, tenor, and bass.

The *soprano* begins at about E on the treble clef and includes the highest tones; the *alto*, or *contralto,* ranges from G on the bass clef to C on the treble clef; *tenor* extends somewhat lower than the contralto; and *bass* begins about C above the bass clef and includes all the lower tones. The average human voice has an extent of about 12 tones, but in trained singers the range is from two to three octaves. Two general divisions have been made of women's voices, the soprano and contralto, and three of men's, the tenor, baritone, and bass.

Singing Tower (*sĭng′ĭng tou′ẽr*), a structure erected as a gift from Edward W. Bok (1863-1930) to the American people, located at Mountain Lake, Florida, on Iron Mt., on the highest point of land in Florida, halfway between the Atlantic and the Gulf of Mexico, in the midst of the beautiful bird sanctuary, Mountain Lake Sanctuary, also donated by Bok. The donor is buried at the foot of the tower.

Single Tax (*sĭn′g′l tăks*), a tax on the economic rent of land, an essential feature of the theory of taxation and program of economic reform urged by Henry George (*q.v.*) in his celebrated book "Progress and Poverty" (1879).

Under the single-tax proposal, a tax on land values or rents would replace all other sources of government revenue. The single-tax philosophy expresses the fundamental idea that the land and natural resources of a country should belong to all its people. The objective of the single tax is to appropriate economic rent, thus vesting the beneficial ownership of land in the public. As a consequence, private property in land would be nominal, but would be left to individuals and business concerns without disrupting the private enterprise economy. Indeed, it is maintained that such a program would strengthen the private-property system and simplify the administration of taxation and government in general. Proponents of the single tax claim that it would contribute to higher levels of national income and welfare, and even solve all economic problems. From the standpoint of equity in taxation, the single tax is justified by the concept that the economic rent of land, exclusive of improvements, is an unearned increment to the recipient, created by the growth and development of the whole community. From the economic standpoint, advocates of the single tax claim that taxation of the unearned increment of land value would not interfere with production, raise prices, nor decrease wages, interest, or the profits of enterprise. Thus, it is contended that by shifting the burden of taxation from labor and capital the single tax would remove tax impediments to production. Proponents of the single tax also claim that it would operate incentive-wise to discourage the holding of idle land for speculative purposes and thus insure its utilization.

While the single-tax theory is generally associated with Henry George and his followers, similar ideas of taxation were advanced by a school of French economists, known as the Physiocrats, in the 18th century. In addition, George was influenced by the thought of the British classical economists, particularly their theories of rent and population. The single tax and other phases of the social and economic philosophy of Henry George have continued to exert wide influence.

In principle, the single tax has been partially applied by governmental units in various countries. Such application has generally taken the form of shifting the burden of taxation from the value of improvements to the value of land.

Sing Sing (*sĭng′ sĭng*). See *Ossining.*

Sinkiang (*sĭn-kyăng′*), one of the westernmost or "frontier" Chinese provinces. Area, 705,952 sq. m. Population, *ca.* 4,000,000 (largely Muslim). See also *Turkestan; Chinese Turkestan.*

Sinking Fund (*sĭng′kĭng fŭnd*). See *Amortization.*

Sinn Fein (*shĭn fān*), an Irish nationalist organization founded by Arthur Griffith in the early years of the 20th century. This Gaelic name is translated as "we ourselves," and the movement embraced the militant section of Ireland which demanded complete separation from Britain and the formation of an independent republic. The Sinn Fein party has been connected with the Easter Sunday rebellion of 1916. In 1918, it was proclaimed a dangerous association by the British authorities, and was suppressed the following year. The movement persisted, however, becoming influential in the formation of the Irish Free State. Internal disputes led to the disintegration of the Sinn Fein and the formation of rival parties based upon new issues, but the original organization continued for a time as a small minority group. See also *De Valera, Eamon; Ireland:* HISTORY; *Irish Free State.*

Sinus (*sī′nŭs*), in anatomy, a cavity within the bone of the skull which ends with the nostrils. Infection of the sinus causes the development of pus, resulting in headaches, numbness, etc. There are various subdivisions of the sinus, such as the frontal, the temporal, the superior maxillary, etc.

Siouan (*sōō′ạn*), the name of a group of Indians found in North America. These natives occupied the greater portion of the plains at the time North America was discovered, but scattered bands had settlements which extended to the Gulf of Mexico and eastward to the Alleghenies. They penetrated far into Canada, from Central Ontario to the Rocky Mts. The Siouan Indians were hostile to the whites, resisting encroachment upon their territory with marked bravery and determination. Among the principal tribes may be mentioned the Sioux, or Dakota, the Winnebago, the Ponca, the Osage, the Omaha, the Flathead, the Assiniboin, and the Mandan Indians.

Sioux (*so͞o*), or DAKOTA, one of the largest tribes of Indians in North America, originally inhabiting the region west of the Mississippi, from the Arkansas River to Lake Winnipeg. They joined the British in 1812, but later concluded peace with the U.S. In 1837 they ceded lands along the Mississippi and made further grants in 1851. Hostilities arose soon after because the government failed to keep its treaties with them, and in 1862 about 1,000 whites were killed in the vicinity of New Ulm, Minn. The public authorities promptly conquered them and executed 40 of the leaders, but the uprising and damages inflicted cost the government about $40,000,000. Several bands fled to the Territory of Dakota, while others found refuge in Canada. The government established a reservation near Yankton, S.D., and provided facilities to enable many of the Indians to engage in farming and stock raising. Sitting Bull remained dissatisfied and went to Washington, D.C., to secure a settlement of the differences, and afterward headed an uprising that terminated in the defeat and death of Gen. Custer in 1876. The Sioux Indian tribe is still one of the largest, numbering about 25,000, and they are noted for their physical strength and skill in horsemanship. Many have made material advancement educationally and in the industrial arts.

Sioux City (*so͞o sĭt′ĭ*), county seat of Woodbury County, Iowa, 158 m. N.W. of Des Moines and 500 m. W. of Chicago, on the banks of the Missouri River. It is served by the Chicago & North Western, the Chicago, St. Paul, Minneapolis & Omaha, the Chicago, Milwaukee, St. Paul & Pacific, the Illinois Central, the Great Northern, and the Chicago, Burlington & Quincy R.R.'s, and by the Mid-Continent Airlines. It occupies a beautiful site on the bluffs of the river, which is spanned by several bridges connecting it with South Sioux City, Neb.

Sioux City ranks high in manufacturing, and leads the state as a wholesale distributing center. The principal manufactures include automotive tools, dry-cell and storage batteries, wind-propelled electric generators, fishing tackle, work clothing, machinery, farm supplies, cold-storage lockers, electrical appliances, and furnaces. It is one of the country's leading poultry and livestock centers, and is one of the seven largest grain markets in the U.S., having a huge capacity for the milling and storing of flour.

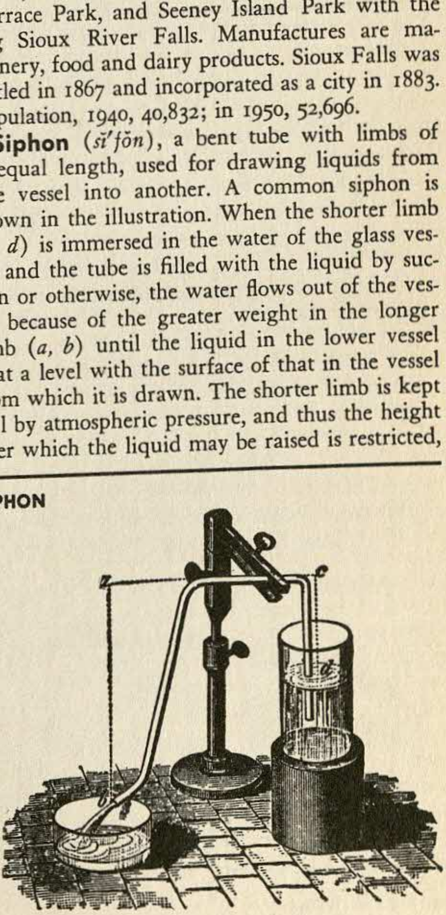
The city's park system comprises over 1,000 acres, including War Eagle Park, named for an Indian chief, and Grand View Park, noted for its flower gardens. Institutions of higher learning in the city include Morningside Coll. and Briar Cliff Coll. The cultural organizations include a symphony orchestra.

The history of Sioux City dates from 1804, when Lewis and Clark explored the Missouri River. Since that time the city has grown steadily and is now Iowa's second largest city. It was laid out in 1854 and incorporated in 1857. Population, 1950, 83,991.

Sioux Falls (*so͞o fạlz′*), the largest city of South Dakota, county seat of Minnehaha County, on the Big Sioux River, 60 m. N.E. of Yankton. It is on the Illinois Central, the Great Northern, the Chicago & North Western, the Chicago, Milwaukee, St. Paul & Pacific, and the Chicago, Rock Island & Pacific R.R.'s. It is surrounded by a fertile farming and stock-raising country. In the vicinity are red-granite quarries from which shipments are made to many points in the Central West. Among the noteworthy buildings are the Pettigrew Museum, the state penitentiary, and the Minnehaha County Courthouse. Sioux Falls is the seat of Augustana Coll., Sioux Falls Coll., and a state school for the deaf. There are many parks, including Sherman Park with its zoo, Terrace Park, and Seeney Island Park with the Big Sioux River Falls. Manufactures are machinery, food and dairy products. Sioux Falls was settled in 1867 and incorporated as a city in 1883. Population, 1940, 40,832; in 1950, 52,696.

Siphon (*sī′fŏn*), a bent tube with limbs of unequal length, used for drawing liquids from one vessel into another. A common siphon is shown in the illustration. When the shorter limb (*c, d*) is immersed in the water of the glass vessel and the tube is filled with the liquid by suction or otherwise, the water flows out of the vessel because of the greater weight in the longer limb (*a, b*) until the liquid in the lower vessel is at a level with the surface of that in the vessel from which it is drawn. The shorter limb is kept full by atmospheric pressure, and thus the height over which the liquid may be raised is restricted,

SIPHON



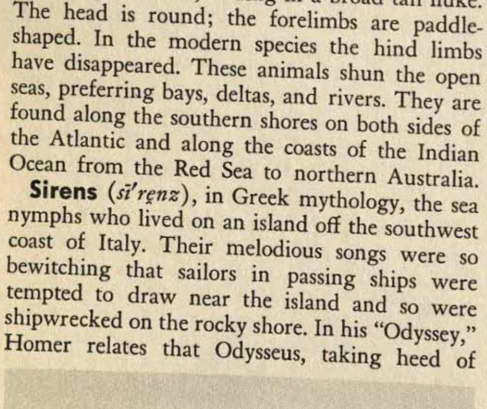
lessening as the liquid decreases. It is possible to siphon water to a height of 32 ft., but denser liquids cannot be successfully siphoned to that height, unless pressure is put on the surface containing the shorter limb. The siphon is used for various purposes, especially in racking wines and liquors, in drainage, and in aqueducts.

Mechanical means can be used to create a siphon.

Siren (*sī′rẹn*), a device for producing sounds, especially loud, whistle-like warning signals. The instrument is also used in acoustical investigations to determine the number of sound waves or vibrations required per second for the production of a tone of a given pitch. It consists of a perforated rotating disk or disks through which air, steam, or the like is forced. As the passage of air is interrupted by the revolution of the rotated disk, sound is produced; the frequency of these interruptions determines the pitch of the tone. The name is a fanciful derivation from the singing sirens (*q.v.*) of legend. See also *Steam Whistle.*

Sirenia (*sī-rē′nĭ-ȧ*), a zoological term applied to an order of aquatic placental mammals, comprising the manatees, dugongs, and sea cows (*qq.v.*). The name Sirenia was given to them because of their supposed resemblance to mermaids. Viewed from a distance, a female dugong floating partly upright and supporting its baby under its flipper might well have given the illusion of a mermaid. The Sirenians have massive, cigar-shaped bodies, ending in a broad tail fluke. The head is round; the forelimbs are paddle-shaped. In the modern species the hind limbs have disappeared. These animals shun the open seas, preferring bays, deltas, and rivers. They are found along the southern shores on both sides of the Atlantic and along the coasts of the Indian Ocean from the Red Sea to northern Australia.

Sirens (*sī′rẹnz*), in Greek mythology, the sea nymphs who lived on an island off the southwest coast of Italy. Their melodious songs were so bewitching that sailors in passing ships were tempted to draw near the island and so were shipwrecked on the rocky shore. In his "Odyssey," Homer relates that Odysseus, taking heed of Circe's warning not to listen to the sweet music of the Sirens, ordered his crew to fill their ears with melted wax. The adventurous Odysseus, nevertheless, determined to hear the music for himself. Accordingly, he had his comrades bind him to the mast, under the promise that they were not to release him until they were out of sight of the island, no matter how much he might implore them to set him free. As soon as he heard the first alluring notes, Odysseus forgot all danger and begged his crew to release him. This they refused to do until the enchanted island was lost to view. Odysseus then thanked his followers for their firmness. The Argonauts, on their return voyage, passed near the Sirens, but the playing and singing of Orpheus saved them from the nymphs' song. The Sirens are represented in art as having the form and wings of birds and the faces of youthful maidens. In some sculptures they have the form of maidens with claws instead of feet.



Courtesy American Museum of Natural History, N. Y.

SIRENIA: DUGONG

Sirius (*sĭr′ĭ-ŭs*) or DOG STAR, the brightest star in the heavens. It is a white double star of the 10th magnitude in the constellation Canis Major. To the Egyptians it was a symbolic warning of an impending Nile flood. To the Greeks and Romans it was a portent of heat. Since Sirius is one of the nearest stars, its parallax (*q.v.*) has been measured with considerable accuracy. Its distance from the earth is about 8½ light years.

Sirocco (*sĭ-rŏk′ô*) or SCIROCCO, an Italian term derived from the Arabian *sharq,* meaning eastern, and applied to the hot, oppressive wind blowing across the Mediterranean from the desert of North Africa. It usually continues to blow from three to six days and, like the simoom (*q.v.*), is inclined to bring on a feeling of exhaustion and suffocation. The greatest effect is felt in Malta, Sicily, and Italy, but it may also reach the Ionian Islands and southern Greece.

Sisal (*sī′säl*) or GRASS HEMP, a fiber derived from the leaves of several species of the American genus *Agave,* of the amaryllis family (which also includes the so-called century plant). Each plant consists of a dense tuft of tough leaves, 2 to 5 ft. long. The veins of these leaves furnish the sisal fibers.

In the manufacture of cordage and twine, sisal is second only to Manila hemp in value. While Central America is the chief production area, the plant is now cultivated in Asia and Africa. The world production is over 300,000 tons per year. Most of the fiber is used in making binding twine used in grain harvesting.

Sisera (*sĭs′ēr-ȧ*), in the Old Testament, a Canaanite captain. According to tradition (Judges 4), he was defeated by Deborah, the prophetess, and her general Barak, when they freed Israel from Canaanite oppression. He was killed by Jael, wife of Heber.

Siskin (*sĭs′kĭn*), or PINE FINCH, a genus of birds, belonging to the family of the true finches. The pine finch is the American siskin. The common siskin is found in Europe and temperate Asia.

Sistine Chapel (*sĭs′tēn chăp′ẹl*), chapel in the Vatican built for Pope Sixtus IV. It is world-famous for its decoration, especially the great frescoes by Michelangelo (*q.v.*). See also *Vatican City*.

Sisyphus (*sĭs′ĭ-fŭs*), in Greek legends, a noted king of Corinth, who was famed for promoting navigation and commerce. Writers credit him with founding the city of Corinth (Ephyra) and the establishment of the Isthmian games. In his later life he became cruel to travelers who visited his dominions, and often slew them by hurling upon them enormous pieces of rock. He was punished for his crimes by being compelled to roll a huge block of stone up a steep hill, which, on reaching the summit, rolled back to the plains below, thus making his task endless.

Sitka (*sĭt′kạ*), a town in Alaska. Located on the western coast of Baranof Island, it is about 160 m. s.w. of Juneau. It has a deep and commodious harbor. The climate is cold, with an average temperature of 42° F.; rainfall is about 90 in. Vegetables are grown in the surrounding area, but grains do not ripen in the short summer season. Lumbering and fish processing are the main industries, and there is a U.S. naval base. Among the principal buildings are the Russian Orthodox Cathedral of St. Michael, a museum, and an industrial school. Founded in 1799 as a trading post by a group of Russians, Sitka was originally known as New Archangel and was the capital of Russian America. After the U.S. purchased Alaska from Russia in 1867, Sitka, the site of the formal transfer on Oct. 18, 1867, remained the Alaskan capital. In 1906 the seat of government was transferred to Juneau (*q.v.*).

Population, 1940, 1,056; in 1950, 1,985.

Sitting Bull (*sĭt′ĭng bŏŏl*), Sioux Indian chief, born on the Grand River, S.D., *ca.* 1834; died on the Standing Rock reservation, Dec. 15, 1890. He was a medicine man and political leader rather than a war chief. His marked hostility toward whites, however, attracted Indians of similar attitude, and his followers were continually on the warpath. After being involved in massacres in Iowa and Minnesota during the Civil War, Sitting Bull was driven west to Dakota and Wyoming territory. In 1875 Indians of the Sioux and allied tribes considered that their reservation had been violated, and they assembled for war under the leadership of Sitting Bull. The following spring Gen. George Armstrong Custer (*q.v.*) was sent against the tribes and his forces were annihilated by them. Sitting Bull (who had done no actual fighting) escaped thereafter to Canada, remaining until 1881, when he was settled on Standing Rock reservation. He became an agitator in the Indian "ghost-dance" movement and was shot during a fight between his tribesmen and Indian police who had come to arrest him.

Courtesy U. S. Indian Service

SITTING BULL

Siut (*sē-ōōt′*), or ASSIUT, a city of Upper Egypt, capital of a province of the same name, 250 m. s. of Cairo. It is situated on the west bank of the Nile, on the Cape-to-Cairo R.R., and is surrounded by a fertile countryside. A large dam across the Nile provides water for irrigation. In the vicinity are ruins of extensive buildings erected early in the history of Egypt, including tombs adorned with paintings and sculptures of historical value. The city has electric lights, public baths, and several fine mosques and bazaars. Pottery, pipebowls, clothing, and utensils are manufactured. Population, *ca.* 60,000.

Siva (*sē′vȧ*), or SHIVA, represents a part of the supreme trinity of Brahmanism (*q.v.*), the other parts being Brahma (*q.v.*) and Vishnu (*q.v.*). Siva is considered the destroying principle while Vishnu represents the preserver. Brahma, corresponding to its origin in the abstract Brahma principle, represents the all-embracing creative power. Peculiarly, Siva is depicted in the form of a phallus (*q.v.*), a symbol which can be found all through India. This fact is surprising since in all other religions which worship the phallus, it is a symbol of life, creation, begetting, and fertility. This seeming paradox has to be explained by the fact that according to the basic idea of Brahmanism, death is just one step in the direction of a new life. Thus the destroyer by its very function creates life again. It is thus not surprising that Siva is called "the happy one."

The origin of Siva is not quite clear. We know that his name appears only after the Vedas (*q.v.*). Many scholars believe that during the process of amalgamation of pre-Aryan (*q.v.*) Indians with the Aryan invaders, qualities of the ancient deity, Rudra, mentioned in the Veda became identified with Siva.

Kali, the wife of Siva, is always depicted in terrifying forms, with many arms, holding a sword, and wearing a necklace of human heads. Often she stands on the prostrate figure of her husband Siva. While she represents the wife of the destroyer, she is at the same time a power *per se,* what Bergson (*q.v.*) would call the fundamental *élan vital*. This productive *élan vital,* or "shkti" in Sanskrit is generally considered as a productive part of every god. So "shktism" worships female power. As a "shkti" of Siva, Kali is also sometimes called Durga.

Six Nations (*sĭks nā′shŭnz*). See *Iroquois.*

Sixtus (*sĭks′tŭs*), the name of five Popes of Rome who reigned within the period between 119 and 1590. Sixtus I was Pope in 119-127; Sixtus II, in 257-259; and Sixtus III, in 432-440. The others are treated in articles below. See *Pope.*

Sixtus IV, Pope of Rome, born near Savona, Italy, July 21, 1414; died Aug. 12, 1484. The village of Celle was his birthplace. He took the Franciscan vow at Savona and early attained a reuptation for eloquence and learning. He was made cardinal by Paul II, in 1467, and was elected Pope on Aug. 9, 1471. Writers have made conflicting statements as to his administration of the pontifical treasury, but all agree that he lavished the treasures accumulated at Rome by providing for his relatives and for the purpose of improving the city and the architecture of the church. Among the structures built by him are the Sistine chapel and the Sistine bridge across the Tiber. He gave encouragement to painters and sculptors and greatly enlarged the Vatican library. Sixtus was the first pope to send missionaries to the Canary Islands. A general Italian war was caused by his alliance with the Venetians against the Duke of Ferrara, which ended in dissolving the Venetian alliance.

Sixtus V, Pope of Rome, born near Montalto, Italy, Dec. 15, 1521; died Aug. 27, 1590. After receiving a liberal education, he was made professor at Rimini and Siena, and afterward became inquisitor-general in Venice. In 1565 he accompanied the papal legate to Spain and in 1570 was made cardinal by Pius V. He was entrusted with editing the corrected edition of the works of St. Ambrose, which were published in 1585. He was not in favor with Gregory XIII and lived in retirement, but on the death of the latter was made Pope, in 1585. His administration of the office was able and energetic. Through study and discretion he attained a high standing among the popes as a ruler and statesman. Besides restoring order in the church, he regulated the finances, suppressed lawlessness, and encouraged commercial enterprises. He fixed the number of cardinals at 70, published a new edition of the Vulgate, which had been ordered by the Council of Trent, improved the Vatican library, and paved the way for vigorous opposition to the growing power of the Lutherans and the Huguenots. Sixtus accumulated vast treasures, which he left to his successors for the purpose of extending the influence of the Church.

Skagerrak (*skäg′ẽr-ràk*), or SKAGER-RAK, a channel extending from the North Sea between Norway and Denmark, communicating with the Kattegat. The length is 140 m., and the width, 75 m.; the depth is sufficient for the largest vessels. Several good harbors are located on the coast of Norway and Sweden. The Skagerrak, the Kattegat, and the Sound form an important connection between the Atlantic and the Baltic Sea.

Skagway (*skăg′wā*), a city in Alaska, located on Lynn Canal, *ca.* 80 m. N.W. of Juneau. It is the southern terminal of the White Pass and Yukon R.R. The city sprang up during the Klondike gold rush of 1897-98 and is today only a shopping center for miners and trappers. Population, 1950, 758.

Skald (*skạld*). See *Scald.*

Skate (*skāt*), the name of several species of fishes of the ray family, having a peculiarly flat body. The snout of most species is pointed, the tail is long and slender, and the upper part of the body is of a grayish or a mottled color. Among the American species are the *barndoor* and the *tobacco-box* skates. Those of Europe include the *common* and *long-nosed* skates. The long-nosed skate has a remarkably long and sharp snout and its body is between 4 and 5 ft. in length. The common skate is very abundant in European waters and attains a large size. It usually weighs about 100 pounds, but sometimes specimens are obtained that weigh as much as 200 pounds or more. This species has a body whose breadth is greater than its length, the proportion being about four to three. This phenomenon, which is common to several species, is due to the expanding pectoral fins being concealed in a peculiar manner under the skin. See *Ray.*

Skates (*skāts*), devices that have a frame formed to fit the sole of a shoe, with a keel-like runner of steel attached beneath, designed to enable the wearer to move or glide over ice. The earliest skates were made of the shinbones of animals, which were fastened to the feet by means of strings. It is thought that the first iron or steel skates were used in Holland, where they served to traverse the numerous canals. Skates are employed extensively for a like purpose in Denmark, Sweden, and Norway.

FIGURE SKATING

Figure skating can be just a winter sport (*top*), but international competition calls for precise skills. Above, Tenley Albright, of Massachusetts, traces compulsory figures for 1956 Olympics judges

Many varieties of skates have been contrived, the construction differing somewhat with the purpose they are to serve. Formerly the frame designed to fit the sole of the shoe was made of wood and was fastened by a heel screw and straps. At present metal is employed instead of wood, and greater security in fastening to the shoe is obtained by springs instead of straps. Skates for speed have a thin runner somewhat longer than the shoe, while the blade of those intended for figure skating is broader and rounded at the toe and heel. *Speed skating* has become a popular sport, of a highly competitive nature. Skating tournaments are annually held the world over, and are a recognized part of the Olympic Games. The speed record for 220 yards is held by Robert Fitzgerald, of Minneapolis; his record time is 18.1 seconds.

James L. Plimpton of New York invented *roller skates* in 1869. These consist of a frame to fit the sole of the shoe. They have two sets of parallel wheels, one each at the toe and heel. They are a popular recreation device, both outdoors and in specially built arenas called *rinks*. Rubber-tired roller skates are also used to provide speed for messengers in industrial plants with extended floor space.

Skeat (*skēt*), WALTER WILLIAM, philologist, born in London, England, Nov. 21, 1835; died Oct. 7, 1912. He studied at London, and in 1858 was graduated from Cambridge Univ., where he became a fellow in 1860. In 1878 he was made professor of Anglo-Saxon at Cambridge, and in 1883 became a professor in Christ's Coll. of that institution. His writings are numerous and many of them have been widely translated. He translated Uhland's "Songs and Ballads" from the German, lectured extensively, and contributed to magazines and periodicals. Among his principal works are "Etymological English Dictionary," "Principles of English Etymology," and "Concise Etymological Dictionary." He published extracts from several authors, including Chaucer's "Canterbury Tales," "Lay of Havelock the Dane," "Piers the Plowman," and "The Kingis Quhair." He founded the English Dialect Society, and did much to promote the study of philology (*q.v.*).

Skeleton (*skĕl'ē-tŭn*), the framework of animals, which in veretbrates is composed of bone and cartilage. It serves to support the fleshy parts and the nervous system, and forms levers for the muscles. In lower animals various structures take the place of the skeleton, as the shell of the clam, oyster, crawfish, and lobster. These formations are called *exoskeletons,* or *dermoskeletons.* The skeleton of vertebrates consists of the skull, the trunk, and the limbs, the whole constituting the *interior skeleton,* or *endoskeleton.* In man the skeleton is constructed after the same type as that found in some of the higher animal forms, but it is of an immeasurably higher development. The human skeleton is characterized by a relatively larger capacity in the skull for the brain development, longer arms, more convenience in the position of the foot, and more freedom of the lower limbs. These superior conditions give to man the ability to move with greater facility and aptness than any other living being.

The skeleton consists of about 200 bones, the number varying somewhat according to age. In the head are 22 bones, which are classed as 8 skull bones and 14 face bones. There are 8 bones in the cervical region, 37 in the thorax, 64 in the upper limbs, 5 in the lumbar region, 4 in the pelvis, and 60 in the lower limbs. Several bones that are separated in youth become united later in life. Thus 5 of the false vertebrae at the base of the spine early join into the *sacrum,* while 4 tiny ones below it often grow into a bony mass called the *coccyx.* The sternum, composed of 5 pieces in childhood, consists of only 3 in the adult. While there is a change in the number of bones, their relative dimensions are adjusted with such exactness that the length of the entire skeleton can be obtained by measuring a single one of the principal bones. All the bones, removed from the body for the purpose of examination and study, form a *natural skeleton,* if connected by dried ligaments. An *artificial skeleton* is made by the bones being joined together by wire.

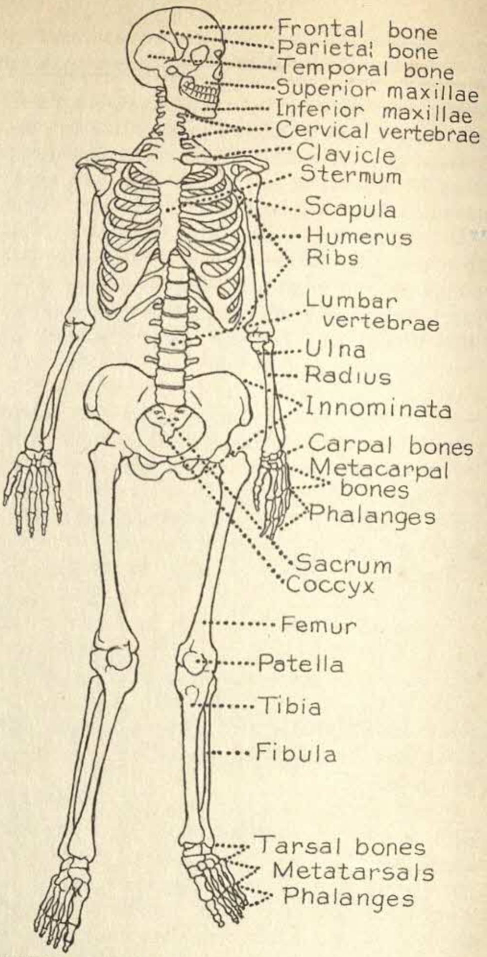
The names of the bones in the human skeleton are shown in the accompanying table:

NAMES OF THE BONES OF MAN

HEAD	*Skull*	Frontal (forehead).
		2 Temporal (temples).
		2 Parietal (side).
		Occipital (posterior base).
		Sphenoid (base).
		Ethmoid (base of nose).
	Face	2 Superior Maxillæ (upper jaw).
		2 Nasal (bridge of nose).
		2 Malar (cheek).
		2 Lachrymal (corner of orbit).
		2 Turbinated (within nostrils).
		2 Palate (posterior hard palate).
		Vomer (nasal partition).
		Inferior Maxilla (lower jaw).
CERVICAL REGION		7 Cervical Vertebræ (neck).
		Hyoid Bone (base of tongue).
THORAX		14 True, 6 False, 4 Floating Ribs.
		12 Dorsal Vertebræ (back).
		Sternum.
UPPER EXTREMITIES	*Shoulder*	Clavicle (collar).
		Scapula (shoulder blade).
	Arm	Humerus (arm).
		Radius, Ulna (fore-arm).
	Hand	8 Carpal (wrist).
		5 Metacarpal (hand).
		14 Phalanges (fingers).
LUMBAR REGION		5 Lumbar Vertebræ (loins).
PELVIS		2 Innominata.
		Sacrum.
		Coccyx.
LOWER EXTREMITIES	*Thigh*	Femur.
	Leg	Patella (knee pan).
		Tibia (large bone).
		Fibula (outer bone).
	Foot	7 Tarsal (instep, heel).
		5 Metatarsal (arch).
		14 Phalanges (toes).

See also *Bones; Foot; Hand; Head,* etc.

Skelton (*skĕl′t′n*), JOHN, poet and clergyman, born probably in Norfolk, England, *ca.* 1460; died in London, June 21, 1529. There is much that is uncertain about Skelton's life, but it is believed that he studied at Oxford and Cambridge universities and was made *poeta laureatus* by both, which meant he had received a degree in Latin grammar, rhetoric, and versification. Some time after 1490 he became tutor to the future Henry VIII and in 1498 took holy orders. After Henry became king, Skelton became court poet. He wrote satires on the clergy, in particular Cardinal Wolsey. His characteristic line—short, alliterative, and with a strong rhyme—is called "Skeltonic." Among his principal works are "Colyn Clout," "Phyllyp Sparowe" and "Why come ye nat to courte."



HUMAN SKELETON

Skepticism (*skĕp′tĭ-sĭz′m*), in philosophy, a doctrine common to several schools of thought which deny the possibility of knowing the ultimate reality. No knowledge of any kind is unquestionable, absolute, complete, or perfect. More specifically, skepticism casts doubt upon the reliability of all knowledge, and especially of that derived from tradition or authority. This pertains especially to the answers on questions of our beliefs, *i.e.,* God, our own personality, any absolute values. Some Greek philosophical schools of antiquity were founded on this principle. The philosophy of the Cynics (*q.v.*), however, should not be confused with skepticism, since the Cynics, although skeptical about some then generally acknowledged values, recognized other values without any doubt. Since Christianity and the philosophies based upon it allow of no such doubts, skepticism was at its ebb during the Middle Ages. For the Christian, revelation was undoubtable exactly as for modern man the results of direct observation or immediate experience are undoubtable. The true skeptic, however, doubts both of these possibilities of gaining knowledge. Applied to specific questions, that means, for instance, that decisions about good and evil are for the skeptic only questions of personal preference or of social habits; decisions about "beautiful" or "ugly" seem to him only utterances of personal taste.

The first modern skeptic of note was the French philosopher Michel de Montaigne (*q.v.*), who presented the principles of this doctrine in his "Essays." A more scientific approach was expressed by David Hume (*q.v.*), who doubted even the ideas of substance and cause, thus undermining the very foundations of science. At the same time, he nevertheless overestimated the possibilities of the approach of natural science. The rationalism and agnosticism (*qq.v.*) of the French Enlightenment of the 18th century were closely allied to the intrinsic skeptical approach. The German philosopher Immanuel Kant and later Herbert Spencer (*qq.v.*) of England expressed skepticism concerning ultimate reality. See also *Epistemology; Philosophy; Rationalism.*

Sketch Book (*sḳĕtch bo͝oḳ*), a collection of essays and short stories by Washington Irving (*q.v.*) published in 1819-20, containing such works as "Rip Van Winkle" and "The Legend of Sleepy Hollow" (for an illustration, see *American Literature*).

Ski (*sḳē*), one of a pair of wooden devices, usually 4 to 8 ft. long and 2 or more in. wide, which are strapped to the feet and used in gliding over a snow-covered surface. The front end is usually pointed or curved upward. In Scandinavian countries and also in Great Britain, the word is pronounced *shē*.

Sḳiing has become a recognized sport the world over. Many American winter resorts feature skiing facilities as their main attraction. *Water sḳiing,* in which the person on skis is pulled over water by a motor boat, is also becoming a comparatively popular sport. Skiing is part of the Winter Olympic Games, with the events being divided into jumping, cross-country, downhill, and slalom contests.

Norwegian Official Photo

HERRINGBONING

Courtesy Union Pacific Railroad

SKI JUMP

The first American skier to win an Olympic gold medal was Gretchen Fraser (1919-), who won the special slalom race of the Winter Olympics at St. Moritz, Switzerland, 1948. In 1951 the American ski jump record (289 ft.), held by Torger Tokle since 1942, was surpassed by Ansten Samuelstuen, who jumped 316 ft.

Skimmer (*sḳĭm'ĕr*), a spectacular shore bird about 18 in. in size, with a handsome black-and-white plumage and very long wings. The bill is bright red, tipped with black, long, and sharply flattened laterally, with the lower half projecting well beyond the tip of the upper half. When feeding, the bird skims very close to the water's surface (hence its name), cutting the water with the tip of its lower bill. It is believed that this attracts or disturbs small fish that the skimmer then picks up. One species inhabits Africa, another India, and a third the Atlantic coast of North America and the Pacific coast of South America.

Skin (*sḳĭn*), the outer covering or integument of the body of animals, which is a sensitive, complex, tough, elastic organ essential for well-being as well as maintenance of life. Its functions are primarily protective, sensory, and heat-regulatory. In man, to which this description applies, the skin is marked by wrinkles, fine intersecting lines, and tiny pores. The latter, numbering several million, represent either the combined openings of hair follicles and their attached oil glands or the openings of sweat glands.

The skin is formed of two major layers: the external, or the epidermis; and the inner, or dermis (also commonly called derma, corium, or trueskin). The *epidermis* is richly cellular, lacks blood vessels, and is nourished by tissue fluids oozing about and between its cells. Over most areas, the epidermis is paper thin, but, over the palms of the hands and the soles of the feet, it is much thicker. In the deepest layers of the epidermis, new cells are continually generated, and, as these are pushed outward toward the surface, they become devitalized and gradually transformed into dense, cornified, closely adherent, microscopic plates. At the very surface, these plates become loosened and are slowly shed. In the process of cornification, the dense, very resistant, fibrous protein material called keratin is formed. Keratin is the material which forms nails; hair also contains much keratin. The deepest cornified part of the epidermis has the vital function of providing a barrier that makes the skin essentially impermeable to water and salts. The brown pigment of the skin, melanin, is generated in special highly branched cells called melanocytes, which are scattered along the bottom layer of the epidermis. The amount of melanin present is a chief factor in determining the color of the skin.

The *dermis* is generally one to two millimeters thick and comprises a dense network of interlacing, fibrous, connective tissue well supplied with blood vessels and nerves. This inner layer is highly sensitive. Injury or destruction extending into the corium generally heals with scar formation.

The appendages of the skin are the hair follicles, with their attached oil or sebaceous glands and contained hairs; the sweat glands; and the nails. Hair follicles can be considered modified epidermis, extending to the depths of the dermis. The cells in the deepest part of the follicle constitute the generative tissue of hair. This tissue has a characteristic cyclic activity which results in the periodic shedding and regrowth of the hair produced by any one follicle. The average life of individual hair varies from about five months for downy hair to above five years for long scalp hair. Hairs are most densely distributed on the scalp (300 per sq. cm. compared with about 20 per sq. cm. on the backs of the hands). After maturity, hairs are also densely distributed in the pubic regions and under the arms. See *Hair*.

The sebaceous glands are minute multilobulated structures whose oily product, sebum, is discharged into the upper portions of the hair follicles. Sebum is formed by a process of fatty transformation and disintegration of the epithelial cells constituting these glands. It provides the major part of the protective and lubricating fatty film which normally covers the skin surface. Lipids released from cornifying epidermal cells also contribute a lipid film to the surface.

The sweat glands of human skin consist of individual, long, epithelial, blind tubules, the lower portions of which are coiled into ball-like structures from which the upper ductal portions arise and spiral through the epidermis to the surface. Sweat secretion functions primarily to cool the body through its evaporation and thereby prevent overheating. Under extreme conditions, as much as 8 liters of sweat may be produced daily. Normally, about ½ liter of water is lost from the adult human skin surface in one day. Sweat, in qualitative respects, is an ultrafiltrate of blood plasma composed overwhelmingly of water. Some constituents, such as urea and lactic acid, are much more concentrated in sweat than in plasma. Others, such as glucose and salt, are much less concentrated, indicating active secretory function on the part of the sweat glands similar in some respects to kidney function. Sweating, however, can contribute only in an insignificant degree to the excretion of toxic metabolites from the body.

Most substances are absorbed only to a minute degree through intact skin, and this largely through the appendaged walls. Materials soluble both in lipids and water are usually better absorbed than those soluble in only one of these.

The nails are densely compacted, cornified plates which grow on the upper fingers and toes and rest on the dermis, which is highly sensitive beneath the nail. The root of the nail is covered by a layer of skin, but the body of the nail is visible. A crescent-shaped white lunula can be seen through the nail near its root. A nail is usually renewed completely after six months of growth.

Skin Diving. See *Diving*.

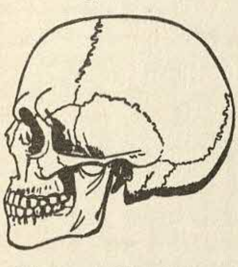
Skink (*skĭnk*), any of more than 600 species of the lizard family Scincidae. Skinks are small animals, most of them only a few inches long and the largest only 2 ft. Often, the legs appear small in proportion to the usually slender, smooth body. Some species lack forelimbs; others have no legs at all and thus superficially resemble snakes. Skinks are found almost everywhere lizards occur, even on remote oceanic islands. Most North American species have a striped body and brilliant blue tail, but the colors fade in large adults. The tail may break off if grasped by an enemy, but a shorter tail will grow in its place.

Skinner (*skĭn′ẽr*), CORNELIA OTIS, actress, monologist, and writer, born in Chicago, Ill., May 30, 1901. The daughter of the famous actor, Otis Skinner, she turned naturally to the theater, and after her graduation from Bryn Mawr Coll. (1922), prepared herself for a career as an actress with the Sociétaires of the Comédie Française and at the school of Jacques Copeau in Paris. She has appeared in many Broadway plays, including "Blood and Sand," "In the Next Room," and "White Collars"; but she is probably best known for her original monologues, such as the series "The Wives of Henry VIII," "The Loves of Charles II," and "Mansion on the Hudson." Her collections of humorous essays and stories include "Excuse It, Please!" (1936), "Soap Behind the Ears" (1941), "Our Hearts Were Young and Gay" (with Emily Kimbrough, 1942), and "Bottoms Up" (1955). Her play, "The Pleasure of His Company" (written with Samuel Taylor), was produced in 1958.

Skinner, OTIS, actor, born in Cambridge, Mass., June 28, 1858; died in New York City, Jan. 4, 1942. He played Shakespearean roles with Edwin Booth and was with the companies of Lawrence Barrett and Augustin Daly. For a few seasons he was leading man opposite Mme. Helena Modjeska. In 1894 he formed his own company. One of his notable roles was that of the beggar in "Kismet" (1911-14).

Skirret (*skĭr'ĕt*), a perennial plant of China and Japan. It is cultivated for its edible root, which resembles that of a parsnip, but is clustered and somewhat aromatic.

Skua (*skū'ȧ*), or JAEGER GULL, a web-footed bird of the gull family, widely distributed along the coasts of the northern seas. It is distinguished by having a strong bill, long wings, a wedge-shaped tail, and a full and stout body. In disposition these birds are quarrelsome. They frequently pursue terns and gulls to compel them to drop fish and other articles of food. All the species pursue and feed upon living birds in the habit of the hawk. The *Arctic skua* is about 20 in. long.



SKULL OF CAUCASIAN

Skull (*skŭll*), the framework of the head of a vertebrate animal. It consists of the cranium and face. The human skull has 22 bones, of which eight are in the cranium and 14 are in the face, but besides these are the bones of the ear and the teeth. A marked difference is noticeable between the skull of man and that of lower animals, in that the human skull has larger brain capacity and relatively a smaller face and jaws. The oval form is the best to resist pressure equally applied on all sides, and ample protection to the delicate brain is provided by the bones being composed, in general, of two compact plates, with a spongy layer between them. The *frontal, occipital,* and two *parietal* bones form the vault of the skull and are united by notched edges called *sutures.* These joints are not entirely closed in infants, but on the top is an opening termed the *anterior fontanelle,* so named from the perceptible pulsations of the brain, and it does not disappear entirely until the second year after birth, though sometimes the opening remains still longer. The skull grows rapidly during the first seven years of life and upon attaining full development the interior capacity is about 85 cu. in., though often 92 cu. in. At one time there was a widely held belief that intelligence could be estimated from the structure of the skull. Science has discredited the idea. See *Face; Facial Angle; Head.*

Skunk (*skŭnk*), a genus of quadrupeds of the weasel family, which are native to North America. They are about the size of a large cat. The common skunk has a long tail and very short legs. The general color is black, with white patches on the head and body. It is about 20 in. long and its tail is 13 in. The skunk resembles the polecat in having a potent and disagreeable odor that can be perceived at a long distance, which it emits from anal glands. These glands secrete a fluid that is thrown with considerable force when the animal is acting in self-defense or is scared, and its disagreeable scent can be removed only with much perseverance. Several species have been enumerated. They differ somewhat in size, but their habits are quite similar. They feed on eggs, birds, insects, reptiles, fruits, and small animals, which they hunt at night. The winter is passed largely in a dormant state. The flesh of the skunk is considered a wholesome food by the Indians and others, being tender and nutritious. Skunk grease is of value in dressing leather and the skins are important for their fur.

Courtesy N. Y. Zoological Society

EASTERN SKUNK

Sky (*skī*), the apparent dome over the earth, serving as a background for the clouds, sun, moon, and stars. It is usually bluish in color, assuming that color from the selective scattering of light rays by minute particles of dust and vapor. See also *Astronomy; Atmosphere; Clouds; Planets.*

Skye (*skī*), an island of the Hebrides, lying off the w. coast of Scotland, about 600 sq. m. in area, and, after Lewis, the largest of the group. It is nicknamed the "winged isle," owing to its deeply indented coastline, which spreads out into long promontories resembling wings. It is one of the Inner Hebrides, and parts of its southern shores are separated from the mainland only by the narrow channels of Kyle Rea and Kyle Akin, which are crossed by ferries. The shores are precipitous and indented by numerous gulfs and bays. A large part of the surface of the island is mountainous. The Coolins are its highest hills, having peaks rising over 3,200 ft. above sea level. Although there is considerable pastureland giving rise to a cattle and sheep raising industry, the soil is generally poor. The chief agricultural products are oats, potatoes, and vegetables. Other industries are fishing and marble-quarrying. At Portree, the island's capital and chief port, there is a tweed and carpet factory. The city has an excellent harbor and enjoys a considerable trade. Most of the inhabitants speak Gaelic as well as English, but some speak only Gaelic, which is the mother-tongue of the islands. The abundance of Celtic relics and early Christian and medieval ruins, as well as its great scenic beauty make the island a haven for sightseers. Dunvegem Castle (built, 15th-16th centuries) is the seat of the chiefs of Clan MacLeod, and Duntuln Castle, former seat of the Macdonalds of Sleat, is an imposing ruin. Prince Charles Edward, the "Young Pretender," took refuge in Skye after his defeat at Culloden in 1746, and Dr. Samuel Johnson visited it in 1773. The Norsemen, who occupied the Hebrides for over four centuries, have left few traces of their presence, though many place-names are of Scandinavian origin. Population, *ca.* 10,000.

Skye Terrier (*skī tĕr'ĭ-ēr*). See *Dog; Terrier.*

Slag (*slăg*), a fused compound obtained in the reduction of metallic ores, consisting of silica in combination with bases, such as lime or alumina. All classes of slags contain some metallic ores, owing to the fact that conditions necessary to extract all the metal cannot be obtained. Formerly the proportion of metal wasted was quite large, but in recent times many of the old slags have been smelted profitably. Ideal conditions require that the fluidity be such that the metal may sink steadily through the slags, that undesirable bodies be not separated from the slags themselves, and that they fuse at the right temperature. Slags are various in color, owing to the presence of different metallic oxides. Copper gives them a red or reddish brown, manganese a dark brown, and iron oxides a dark green or black color. In many of the older countries, slag is used for road building and other purposes.

Slander (*slăn'dēr*). See *Libel.*

Slang (*slăng*). See *Americanisms.*

Slate (*slāt*), a kind of rock formed as a metamorphic equivalent of shale, as a result of the action of extreme pressure and heat on shale strata during mountain-building processes. It differs from shale in splitting readily into thin plates or sheets. It includes species having a variety of colors, among them bluish or grayish black, reddish brown, and greenish blue. Most species may be cut or scratched with a knife. Slate occurs in all countries having metamorphic rocks, and the quarried products are used for many purposes in manufacture and construction. The deposits differ in thickness and sometimes several grades of slate are found in different parts of the same quarries. Their uses depend upon the particular composition and the size of the sheets that may be obtained. Fine-grained species, yielding large, thick slabs, are used to make billiard tables, burial vaults, electrical switchboards, and sinks. The more fissile grades, which split into thin slabs, are employed for roofing and school blackboards. Slate is utilized in polishing, and a soft variety is used for slate pencils. Slate granules are used for prepared roofing. The most extensive North American deposits occur in Pennsylvania, Vermont, New York, Maine (electrical slate), and Quebec, where slate quarrying is an important industry. Small amounts of different grades are exported to various countries, but exports are comparatively unimportant. Large deposits of slate occur also in other sections of North America, and in Wales, France, and Scotland.

Slater (*slāt'ēr*), JOHN FOX, philanthropist, born in Slatersville, R.I., Mar. 4, 1815; died in Norwich, Conn., May 7, 1884. His father was John Slater, brother and partner of Samuel Slater, the great textile manufacturer. Young Slater entered his father's woolen mill in Hopeville, Conn., about 1832 and a few years later took over the management of that mill and a cotton mill at Jewitt City, Conn. He became sole owner of the family mills in 1872. In 1882, he set up a $1,000,000 trust fund known as the Slater fund, incorporated in New York State. This fund was to be set aside for the education of the recently emancipated Negroes of the Southern states. It has been used chiefly to endow normal and industrial training schools for Negroes.

Slater, SAMUEL, textile manufacturer and founder of the U.S. cotton spinning industry, born in Belper, Derbyshire, England, June 9, 1768; died in Webster, Mass., Apr. 21, 1835. In 1783, he was apprenticed as a cotton spinner to Jedediah Strutt, partner of the inventor and industrial magnate, Richard Arkwright. Slater came to America in 1789 and went into partnership with William Almy in Pawtucket, R.I. He made drawings from memory of the Arkwright spinning machines, since neither the designs nor the machines were allowed to be exported, and built the first cotton mill modeled on the Arkwright system in the U.S. He built another mill in Rehoboth, Mass., in 1801, and, in 1806, he and his brother, John, developed the cotton-manufacturing village of Slatersville, R.I. By 1810, 100 mills were operating on this system in the U.S. Slater's mill in Webster, Mass., began to manufacture woolen cloth in 1815. In 1827, he built the first mill to use steam power at Providence, R.I. He took a kindly interest in the welfare of his workers and opened day schools and Sunday schools for workers' children.

Slaughterhouse Cases (*slạ̈'tẽr-hous ķās'ęz*), a series of notable cases upon which a decision was rendered by the U.S. Supreme Court in 1873. These cases resulted from the Louisiana state legislature's measures restricting the butchery industry in New Orleans. In the interest of public health the legislature in 1869 granted a 25-year monopoly to one slaughterhouse concern, thus putting a number of other concerns out of business. Their operators brought suit on the grounds that a monopoly was being created and that they were being deprived of their property without due process of law, in violation of the Fourteenth Amendment of the Constitution.

The majority opinion, delivered by Supreme Court Justice S.F. Miller, declared that the Fourteenth Amendment, originally drafted as a protection for freed Negroes, in no sense deprived the individual states of legal jurisdiction and protection over the civil rights of their citizens. The Court, which sustained the state by a 5-4 vote, therefore held that the act fell within the police power of the legislature. It pointed out the existence of both a Federal and a state citizenship, each entailing distinct privileges and obligations. This decision in favor of the State of Louisiana was termed conservative, in that the Federal government made no attempt to extend its powers over the states.

Slavery (*slāv'ẽr-ȳ*), the institution under which human beings are held in involuntary subjection as the property, or chattel, of others. It implies total or at least limited loss of personal freedom and political rights. Slavery has existed in some form since the earliest times in every region of the world. The incidence and characteristics of, and the attitudes toward, slavery have varied widely according to the general economic, social, and cultural conditions of societies at different periods. In general, slavery has been practiced by peoples whose recently acquired political power was great enough or whose actual conquest was complete enough to permit them to establish themselves in one locality and pursue ordered and relatively large-scale agricultural and commercial activities. Labors necessary to the development of a prosperous society were almost everywhere first imposed by the strong on the weak. Of the various forms of servitude (serfdom, vassalage, villeinage, thraldom, and so on), slavery was the most complete and the most detrimental because of its moral effect on both master and slave.

Among many primitive tribes in Africa, the Malay Archipelago, Indo-China, India, and the Bering Straits, slaves might be traded or killed, used for compulsory labor, or for sacrifice in religious ceremonies. Extreme cruelty was somewhat rare, however, and there was often little distinction between slaves and the lower free classes. During antiquity, slavery became an accepted and well-established legal and social institution among all peoples. In Greece, the slave was an element of private property which could be leased or traded. As the sources of slavery were war, piracy, purchase, and bondage for debts, slaves were not necessarily of different upbringing or race from their masters. There was little or no moral problem connected with slavery, and at first there were few social distinctions in societies engaging in slavery because almost anyone might be kidnaped or captured in war and enslaved. Later, as slavery became more widespread and as a regular slave-procuring trade developed, social attitudes changed.

Slaves were employed in domestic service, in agriculture, mining, handicraft industries, business, public works, and as servants in temples. Military duty was the privilege of free citizens except in moments of crisis. Discipline and privileges of slaves depended to a large extent on the masters and the type of labor in which the slaves were engaged. Slaves of various nationalities were mixed in order to prevent revolts, and sometimes they were fettered to prevent escape. Their tasks were often of the most menial kind, but a not inconsiderable number of slaves rose to positions of importance and enjoyed the affection of their masters. In Athens, slaves were permitted to accumulate savings, to marry, and to participate in certain social and religious activities. They were protected from killing and mutilation and could purchase their freedom in various ways. The status of a freedman, however, did not as a rule carry with it full civil rights.

By the 4th century B.C. enormous numbers of slaves were being brought into both Greece and the Roman empire. Extensive colonization and the expansion of Mediterranean commerce after about 800 B.C. created greater demands for slaves. A regular slave-procuring trade was established in Rome fulfilling a legitimate function as a social institution. With the conquest of the peninsular section of Italy, great farms, or latifundia, were distributed among wealthy citizens. Extensive conquests engaged the majority of the Roman farmers outside Italy but also produced overwhelming numbers of prisoners of war who were sold into slavery and used on the latifundia. On the island of Delos, one of the principal slave markets in the 2nd century B.C., as many as 10,000 slaves might be traded in a single day. Between 146 B.C. and 235 A.D. the number of slaves probably equaled the number of free citizens, and the ratio may have been three to one. The bitter exploitation and extreme cruelty of the gang labor system brought dangerous revolts particularly in Sicily and southern Italy. Spartacus, a Thracian, led a notable slave rebellion against Rome in 73-71 B.C. With the establishment of peace in the Roman empire, however, supplies of slaves decreased, and the condition of slaves became progressively better.

Employment of slaves was highly specialized in this later period. In addition to manual labor, they were used in professions and business, as well as entertainers. At first they could not enter into any legal contracts, and the masters retained the power of life and death over them, but by the 2nd century A.D. new attitudes developed toward slavery. Protective laws were established, and the slaves were granted greater legal and civil rights. With the rise of Christianity, masters were encouraged to treat their slaves well, and manumission was greatly facilitated. As freedmen, former slaves held public office and entered the professions.

Slavery during the Middle Ages was generally of a milder character. Gradually, there came to be little distinction between free citizens and slaves since both might be bound to the land or to their occupations; intermarriages were frequent. The religions disapproved of the enslavement of people of their own faith, but made no active attempt to abolish the system. Manumission was considered an act of piety rather than a privilege of the slave.

The slave trade declined between 900 and 1300 because there were fewer wars and serfdom (in which the individual's service is attached to the land and transferable with it) was better adapted to general economic conditions than slavery. About 1300, however, slavery began to increase. Growing nationalism and religious intolerance produced further conflicts, notably Turkish and Moorish invasions of eastern Europe and the Near East, and a flourishing slave trade was carried on by Venetians, Saracens, Africans, and Mohammedans. An estimated 50,000 persons were sold into slavery after the fall of Constantinople in 1453.

In the middle of the 15th century, the Portuguese embarked on an extensive overseas slave trade from the west coast of Africa, and for half a century they had a monopoly on the European market. Spain entered the slave trade in 1517, England in 1553, and France in 1624. The enslavement of heathen peoples was sanctioned by the Catholic Church, and there were many church slaves.

Within a short time after the discovery of America, the slave traffic spread to the newly established colonies. The exploitation of natural resources demanded slave labor for large-scale production. The aborigines who were first pressed into slave labor died off rapidly from disease and cruel treatment or escaped into the interior. Thus, the first Negro slaves, who proved much more adaptable, were brought to the New World at the end of the 15th century to replace native labor. From the time of Queen Elizabeth, the English carried on a flourishing slave traffic, perhaps the most profitable type of maritime trade during the 18th century.

Slave codes came into existence locally and varied considerably in the harshness of their provisions from colony to colony and in different periods. In general, the slave was looked upon as the personal property of his master and denied all personal and civil rights except those which were established by custom. In some respects, the slaves in the English colonies were in worse conditions than those of Hispanic America, for the latter were protected to a degree by the Catholic clergy, and it was always possible for a slave to buy his freedom, particularly if he were a skilled craftsman. In Hispanic America, moreover, slavery was not so much based on race distinctions, and slaves could intermarry, become free, and rise in the social system. All over the Americas, however, slaveholders exercised the power of life and death and perpetrated various cruelties.

In some of the Southern colonies of North America laws existed for a time forbidding slaveholders to grant manumission, and a Negro was always considered a slave unless he could prove his freedom. Throughout the existence of slavery in the U.S. it was a debatable point as to whether the slave had any real rights under the common law. Most of the colonies protected the slave in that they regulated or prohibited murder, mutilation, and fettering, but in actual practice the treatment of slaves depended entirely on the masters. There are known instances of atrocious cruelty, but it seems probable that many of the Southern plantation owners exercised a benevolent, even affectionate authority over their slaves, particularly over those who were house servants. They lived in cabins near the master's mansion, were often permitted to establish a family and raise chickens, pigs, and vegetables to supplement their starchy diet; were also supported in old age and sickness, and were given some religious instruction. The sharp social distinction between black and white remained, however.

ANTI-SLAVERY MEETING HELD IN LONDON IN 1841

During the latter part of the 18th century, a growing sentiment against slave traffic and the institution of slavery began to ferment in Europe and North America. Both Great Britain and the U.S. passed laws prohibiting slave trading and importing in 1807. In the U.S. distinguished statesman, writers, and humanitarians, especially the Quakers, condemned slavery, and as as early as 1780 antislavery societies began to spring up all over the North. The Constitutional Convention veered away from the slavery question but did agree to abolish the slave traffic after 20 years and prescribed measures for the recovery of fugitive slaves and slave representation. A number of the Northern states invalidated slave property in their constitutions, and by 1804, all the Northern states had taken steps to free their slaves. Fear of economic collapse prevented action in the South.

From a moral and economic question, slavery rapidly became a national political issue. This was due to the different economic systems of the North and the South. Northern economy was based on small farms and "free" labor, and tended toward industrialization. In the South, economic prosperity depended on large plantations (particularly cotton and sugar cane) where large-scale production demanded slave labor. The invention of the cotton gin in 1793, moreover, had led to a vast extension of the plantation system.

Another important question revolved on new territory which was rapidly being acquired through purchase, treaty, or conquest: should slavery be extended to new territories, and should the decision rest with Congress or the individual states? Slavery was prohibited in the Northwest Territory (1787) and in Oregon (1848). The Missouri Compromise (1820) prohibited slavery above the Mason and Dixon Line (*q.v.*), except in Missouri, but did not settle the question. By the Compromise of 1850, California was admitted to the Union as a free state, New Mexico and Utah were allowed to choose for themselves whether or not they wanted slavery, the slave trade was prohibited in the District of Columbia, Texas boundary claims concerning territory ceded to New Mexico were settled by payment, and a more stringent fugitive slave law was put into effect. The Kansas-Nebraska Act (1854), fostered by Stephen A. Douglas, instituted "squatter sovereignty"—the provision that the settlers should be allowed to decide the slavery question for themselves; together with the Dred Scott Decision (which held that Congress had no power to prohibit slavery in the territories, 1857) it led to a famous debate between the Democratic and Republican leaders, Stephen A. Douglas and Abraham Lincoln.

Meanwhile, violent sectionalism was developing. The Missouri Compromise had laid the foundations for Abolitionism (*q.v.*). Antislavery organizations sent petitions to Congress, distributed books and pamphlets, and were instrumental in establishing an "underground railway" among the free states to help fugitive slaves reach the Canadian border. The South was becoming increasinglv hostile to Federal legislation and the sectionalism of the Republican party which numbered many Abolitionists in its membership. Thus the election of Abraham Lincoln to the Presidency in 1860 was interpreted as a victory of the antislavery movement, although Lincoln himself was not a violent Abolitionist.

During the Civil War (*q.v.*) which followed, Lincoln issued the Emancipation Proclamation (Jan. 1, 1863) which freed some 4,000,000 Negro slaves and put an effective end to slavery in the U.S. The Thirteenth Amendment (1865) prohibited slavery in U.S. territory and was followed by the Fourteenth and Fifteenth Amendments which gave the Negroes full civil rights.

Both the French Revolution and the American Civil War were strong forces in bringing about the abolition of slavery and slave traffic internationally. Great Britain invalidated the legal status of slavery and instituted a progressive emancipation of slaves in her West Indian possessions (1833), India (1843), and Africa (1897). Other countries followed suit: Sweden (1846), France (1848), Holland (1859), Brazil (1871), Spain (Puerto Rico, 1873; Cuba, 1880), Germany (Africa, 1901). The Spanish colonies abolished slavery when they obtained their independence. The Treaty of St. Germain (1919) pledged the signatory countries to suppress slavery and slave traffic in all forms. A stronger convention put forth by the Slavery Commission of the League of Nations (1926) and ratified by 38 countries was pledged to suppress all forms of slavery, forced labor and slave traffic. Slavery still exists in some form in parts of Africa, the Near East, and Asia. There were, in accordance with latest estimates, 5,000,000 slaves in various parts of the world.

Slavs (*slävz*), the most numerous branch of the Caucasian family which at present occupies large sections of Europe and the northwestern part of Asia. The Slavs are divided geographically and linguistically into three main groups: Eastern, which includes White Russians, Great Russians, and Ukrainians; Northwestern, comprising Poles, Wends, Czechs, and Slovaks; and the Southern group, made up of Slovenes, Serbs, Croats, and Bulgarians. The original homeland of all the Slavs was the territory located north of the Carpathian Mts. and extending northeastward to the densely forested basin of the Pripiet River. They led a peaceful life as farmers and herdsmen and were quite undeveloped in political and social organization. Between the 2nd and 5th centuries A.D. they grew increasingly numerous, and under economic pressure began expanding outward in all possible directions, until they had made contacts with other peoples and cultures and had become differentiated into the various Slavic nations of the present day. Their settlements on the Lower Danube date from the 6th century, when they passed into Thrace, Bohemia, Hungary, and Styria. In the 7th century they formed settlements in Bosnia and Serbia and ultimately spread northward over the region of modern Russia. A portion of their settlements in the south subsequently became a part of Greece and Turkey, while Hungary and parts of Transylvania were occupied by the Magyars and Rumanians, and large parts of Austria were taken by various peoples of Germanic origin.

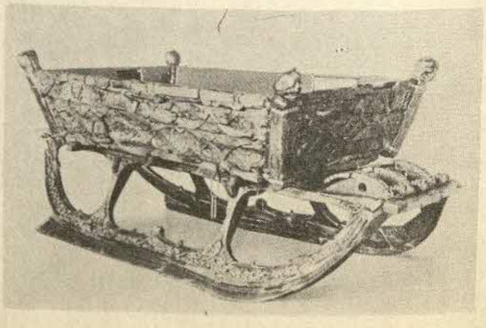
The introduction of different forms of Christianity established a division among Slavs. The Poles, Slovaks, and Czechs accepted Christianity from the Roman Catholic Church while the rest of the Slavs were introduced to the Christian world through the Greek Orthodox Church. This original religious separation was of immense importance in its effect on the whole future development of their respective civilizations. Their language shows a close alliance to the Sanskrit, but it is mixed considerably with the spoken tongues of other European peoples.

The physical type most generally associated with Slavs has a snub nose, a broad face, round head, and medium size; however, there are wide variations among the various Slavonic nations due to the assimiliation of foreign elements and to their adaptation to various environments.

Sled (*slĕd*), or SLEDGE, a vehicle for conveying loads over ice or snow. It has two parallel runners constructed of cast iron, or of wood with a steel sole, and both runners are slightly turned up at one end. Primitive sleds are made wholly of wood and have two long runners, but later types used iron or steel, and usually have two sets of runners, the front pair turning on a pivot, like the front wheels of a wagon; these are popularly called *bobsleds.* A *sleigh* is a carriage on runners, usually two, and is used for conveying passengers. These vehicles are finely constructed with one or two upholstered seats and are drawn by one or more horses. Sleighing is a favorite pastime in countries where the climate is sufficiently cold to prevent the

SLEDGE

From the *Osebergfund,* 9th century



snow from melting for several months in winter.

Sleep (*slēp*), a state of repose in which the activity of the senses and brain appears to be temporarily suspended. This state occurs periodically in man and animals and is characterized by partial or complete unconsciousness, relaxed condition of the body, and general diminution of vital functions. It is necessary that all parts of the body actively engaged in the discharge of important functions have a period of cessation from toil, and during the period of sleep the work of building up goes on to repair the loss occasioned by activity during the time of wakefulness. More sleep is needed in youth than in old age, when nature makes few permanent repairs and is content with temporary expedients. The number of hours required for sleep depends upon the character of employment and must be decided by each person according to apparent needs. From six to eight hours each day is the general average. It is of much importance that those who are tired should be allowed to sleep until awakened naturally, else the system does not obtain proper rest.

As compared to the state of being awake, the pulse and breathing are slower while sleeping, the secreting organs of the body are less active, and the pupil of the eye is contracted considerably. Another peculiarity is a lower temperature, especially from two to five o'clock in the morning, when the vitality is at the lowest point. See also *Dreams.*

Sleeping Beauty (*slēp'ĭng bū'tĭ*), a widely known fairy tale about a lovely princess who is awakened from her 100-year sleep by the kiss of a prince. The story has parallels in many of the ancient myths. The English versions have been taken from translations of *"La Belle au Bois Dormant"* by Charles Perrault and *"Dornröschen"* (or "Little Briar Rose") by the brothers Grimm. Peter Tchaikovsky (*q.v.*) used the tale for a full-length ballet, "The Sleeping Beauty" (1889). See also color plate in Volume I.

Sleeping Sickness (*slēp'ĭng sĭk'nĕs*), or TRYPANOSOMIASIS, in medicine, an endemic disease found in equatorial Africa. It is caused by a blood parasite, the *trypanosoma gambiense,* which is conveyed by tsetse flies. The most characteristic symptom is a continuous sleepiness, which finally leads to a coma. Sleeping sickness is not identical with encephalitis lethargica (*q.v.*).

Sleet (*slēt*). See *Hail.*

Sleigh (*slā*). See *Sled.*

Slidell (*slī-dĕl'*), JOHN, politician, born in New York, N.Y., in 1793; died in Cowes, England, July 29, 1871. He was graduated (1810) from Columbia Coll. and in 1819 moved to New Orleans. As a Democrat, he served in the U.S. House of Representatives (1843-45) and the U.S. Senate (1853-61). He was chosen (1861) to represent the Confederacy in France and while en route to Paris on a British ship, he and James M. Mason (*q.v.*) were seized by the U.S. *San Jacinto.* After his release (1862), Slidell unsuccessfully negotiated for French recognition of the Confederacy. See *Trent Affair; Wilkes, Charles.*

Slide Rule (*slīd rōōl*), an instrument used to solve arithmetical problems. It consists of two parts, one of which slides upon the other, and on the surface of the parts are logarithmic linear scales. Multiplication and division may be performed by means of logarithms, and natural sines, tangents, and square or cube roots may thus be determined. See also *Vernier.*

Slide Valve (*slīd vălv*), a mechanism for controlling the passage of steam through the ports of the steam engine. The valve, also called "D-valve," takes its name from the fact that it slides back and forth over the ports. See *Steam Engine.*

Sligo (*slī'gō*), a coastal county of the Province of Connaught, Eire, bounded on the north by the Atlantic Ocean and the Bay of Donegal. Its capital, of the same name, is located on Sligo Bay, and is the site of a ruined abbey and a busy harbor. Sligo County covers 707 sq. m. of diversified terrain, including a greatly indented coast line, several lakes, wooded hills and bogs. Its navigable streams are the Easky, the Garvogue, and the Moy; picturesque loughs (lakes) include Arrow and Gill. The chief occupation of the inhabitants is cattle raising, although many are engaged in mining (copper, lead, iron, manganese), fishing, and manufacturing (textiles, leather goods). Population, *ca.* 67,000.

Slime Mold (*slīm mōld*), an organism of the order *myxomycetes.* Formerly the slime molds were classed as plants, but they show a close relationship to rhizopods, a class of protozoa. They consist of a mass of protoplasm during the growing stage, but are not definite in size and shape, and multiply by the development of spores. The spores burst and the protoplasm escapes in forms resembling those of an amoeba, each particle developing a delicate hair, or cilium. In this form the young life floats freely within water, but later unites with other plants, sometimes a large number coalescing.

Sling (*slĭng*), a contrivance to throw missiles, such as stones. It consists of a small disk of leather pierced by a hole at each end for the attachment of strings about 3 ft. long, and in the center is a small circular opening so as to permit the missile to lie quite firmly. When the stone or other object to be thrown has been placed in the sling, it is held in one hand by the strings, and after it has been whirled in a circle one string is freed to permit the missile to fly out in the direction aimed. This simple contrivance was important as a weapon among the ancients, both for hunting and for military purposes. It is recounted that the Achaeans and Persians were skillful slingers. Goliath, the celebrated giant of Gath, was felled by David by means of a sling.

Sloane (*slōn*), SIR HANS, naturalist and physician, born Apr. 16, 1660, in Killyleagh, Ireland; died Jan. 11, 1753. He studied medicine in London, Paris, Montpellier, and at the Univ. of Orange. In 1687 he accompanied the Duke of Albemarle to Jamaica on an expedition and there he collected almost 800 species of plants which had theretofore been unknown to botanists. He later published a catalogue of these plants, as well as a two-volume story of the expedition. In 1719 he was elected president of the Coll. of Physicians, an office he held for 16 years. He was named physician-general of the army in 1722 and first physician to George II in 1727. In the same year he succeeded Sir Isaac Newton as president of the Royal Society, of which he had been secretary since 1693. He founded the Botanic Garden in 1721. On his death he bequeathed to England his enormous library and his various collections, and in 1759, after the addition of George II's library, his bequest was opened to the public as the British Museum.

Sloane (*slōn*), WILLIAM MILLIGAN, educator and author, born in Richmond, O., Nov. 12, 1850; died in Princeton, N.J., Sept. 11, 1928. He was graduated from Columbia Coll. in 1868 and subsequently taught in the Pittsburgh Newell Inst. until 1872, when he went to Germany. He stayed there for four years, serving from 1873 to 1875 as secretary to George Bancroft, then U.S. minister. In 1876 he received the degree of doctor of philosophy at the Univ. of Leipzig. He was made professor of Latin at Princeton in 1877, was given the chair of history in 1883, and became professor of history in Columbia Univ., New York City, in 1896. His writings are numerous, including "Life of Napoleon Bonaparte" and "The French War and the Revolution." He assisted George Bancroft in preparing the 10th volume of the "History of the U.S.," edited the "Life of James McCosh," and was editor of the Princeton *Review*. He was one of the founders of the American Acad. of Arts and Letters and served as its president in 1920.

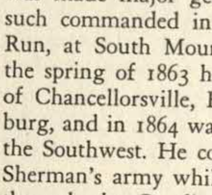
Slocum (*slō'kŭm*), HENRY WARNER, soldier, born in Delphi, N.Y., Sept. 24, 1827; died in Brooklyn, Apr. 14, 1894. He was graduated from the West Point Military Acad., in 1852, and was assigned for service in the artillery. After attaining the rank of lieutenant, in 1856, he resigned his command in the army. Subsequently he studied and practiced law at Syracuse and was elected to the New York legislature in 1860, but entered the army as colonel of the 27th New York Volunteers at the beginning of the Civil War. He was severely wounded at the First Battle of Bull Run, where he rendered valued service. He was promoted to brigadier general soon after.

HENRY W. SLOCUM

Courtesy National Archives

After serving in the Peninsular Campaign, he was made major general of volunteers, and as such commanded in the Second Battle of Bull Run, at South Mountain, and at Antietam. In the spring of 1863 he participated in the battles of Chancellorsville, Fredericksburg, and Gettysburg, and in 1864 was conspicuous as a leader in the Southwest. He commanded the left wing of Sherman's army while marching to the sea and through the Carolinas, and participated at the surrender of Gen. Johnston. In 1868 he entered Congress as a Democrat from the State of New York. He was re-elected in 1870 and 1884, serving on the floor of the House as an efficient and influential representative. He was president of the Brooklyn City board of public works from 1876 to 1884. Slocum served as one of the commissioners of the Brooklyn Bridge.

Sloe (*slō*), or BLACKTHORN, a shrub of the plum family, usually growing to a height of from 6 to 12 ft. The wood is hard and tough and the young growth is used for walking sticks. The flowers are white, preceding the leaves in the spring, and it is regarded by many as the original of the common garden plum. A species known as the *common sloe* is abundant in Europe, whence it was brought to the New England States. The fruit is about the size of a large pea. It has a bitter taste and is sometimes used in making a wine and for preserves. The leaves



SLOE

Flower and fruit

have a greenish appearance, resembling tea, and are used to some extent in adulterating that commodity. The wood is hard and dark colored, takes a fine polish, and is used in making flails, handles to tools, and teeth to rakes.

Slosson (*slŏs′ŭn*), EDWIN EMERY, chemist, born in Albany, Kan., 1865; died in 1929. In 1891, Slosson simultaneously accepted positions as head of the chemistry department of the Univ. of Wyoming and as chemist at the Wyoming Agricultural Experiment Station. He also served as literary editor for the *Independent* (1903-20) and as associate at the Columbia Univ. School of Journalism. He is best known, however, as a writer of books and articles for non-scientist readers and of introductory chemistry textbooks. Among his numerous popular works are "Creative Chemistry" (1919), "Easy Lessons in Einstein" (1920), "Sermons of a Chemist" (1925), and "Snapshots of Science" (1928).

Sloth (*slŏth*), a genus of mammals which belong to the bear family. They are native to Central and South America. These animals are peculiar for their long claws, which turn toward the body, thus making it difficult to move on the ground, but they pass to and fro with remarkable facility on the limbs of trees. They live almost entirely among the upper limbs of the larger trees in the tropical regions, where they are able to pass quite easily from one tree to another by clinging to the branches with their claws while the body is suspended beneath. The lips are long and extensile, enabling them to secure the insects, honey, fruits, and tender shoots of trees on which they feed. They are covered with coarse, shaggy hair, resembling withered grass, which protects them from insects and shields them from observation when at rest in the daytime. The tail is very short. The female produces one young at a birth, which clings to its mother until it is able to provide for itself. Flesh-eating animals and snakes are its enemies, but it protects itself against the former by climbing on the branches of trees and against the latter by using its powerful claws. Several species have been described by naturalists, the best known being the *ai*, or *tḥree-toed sloth*, and the *unau*, or *two-toed sloth*. Both these species have a plaintive cry.

Slot Machine (*slŏt mȧ-shēn′*), a mechanical device designed to facilitate the sale of certain small articles. Machines of this kind are not of modern origin, but their use before 1880 was quite limited. At present many kinds of slot machines are in use, including those designed to facilitate the sale of chewing gum, cigarettes, candy, and perfume. Some are designed to provide entertainment, such as phonographic machines and weighing machines. See also *Juḳe Box*.

These machines are so called from a slot into which a penny, nickel, or some other small coin is dropped by the patron, without which the machine cannot be operated. Most slot machines are stationed in hotels, railroad stations, and other public places, where they are patronized by the public, all the accounts being kept by an automatic mechanism in the machines.

Another kind of slot machine has given rise to a form of gambling, in which kind the patron deposits a small coin, as a 5 or 10 cent piece, hoping to receive in return a larger amount of money. These machines are forbidden in some cities.

Slovakia (*slô-văḳ′ĭ-ȧ*), an ethnographic unit within the borders of Czechoslovakia. A powerful part of the Moravian empire in the 9th century, the Slovaks were later subjugated by the Magyars, and are found today in various parts of Eastern Europe, including Hungary and Austria. Closely allied to the Czechs in language and tradition, they are largely of the Roman Catholic faith. Racially they seem to have affinities with the eastern Slavic world; they are generally blonde with the broad face and snub nose usually associated with the Slavs, are shorter than the Czechs, and are smaller-headed, although equally brachycephalic.

Until the end of World War I, the Slovaks, numbering about 3,500,000, were part of Hungary. When the Republic of Czechoslovakia was formed in 1918, Slovakia became one of its autonomous provinces. Previously an agricultural people employing primitive farming methods, their largely mountainous territory was developed into a flourishing health and tourist resort, and improvements in communication, education, and economy were effected. At this time German, Magyar, and other minorities within Slovakia aspired to an independent state. In 1938, after Germany had acquired the Sudetenland, Czechoslovakia was forced to cede part of Slovakia to Hungary under the terms of an Italo-German agreement, and the remainder of the region was made autonomous, within Czechoslovakia, under its own ministry. In March 1939, when Germany dismembered Czechoslovakia, Hungary seized further territory from Slovakia, reducing it to 14,355 sq. m., and a population of 2,302,343. Slovakia became a republic under a German-sponsored authoritarian government, and was used as a base of operations against Poland in World War II. In May 1945, Slovakia, comprising an area of 18,921 sq. m., was again incorporated into the reconstituted Republic of Czechoslovakia. Population, *ca.* 3,000,000.

Slovenians (*slô-vē′nĭ-ạnz*), a branch of the Slavic people in the southern part of Yugoslavia and Austria. They reside chiefly in Carniola, Styria, and Carinthia. In habits and manners they are closely allied to the Serbians. They number about 1,500,000.

Sloyd (*sloid*), the name of a system of manual training, of Swedish origin, called *slojd*, meaning "skill" or "dexterity." Its popularity dates from 1876, when Otto Solomon, president of the normal school at Naas, promoted a greater interest in its development. Originally it trained students in the manufacture of wooden household utensils, but now includes mechanical drawing and the use of complicated tools. The aim is to fit the student for industrial work. The Sloyd system has been adopted in a more or less modified form in many countries of Europe and America.

Slug (*slŭg*), the common name of a genus of mollusks, differing from the snail in having only a rudimentary cell. The form is elongated and more or less concealed by a mantle. On the head are four tentacles or feelers that can be drawn back. These tentacles consist of two pairs, a short and a long, and on the tips of the longer pair are the eyes. Slugs become dormant in frosts, taking shelter under clods and vegetable forms. They often frequent trees in search of decaying vegetable matter, on which they feed, and in some places they ravage fields of growing crops during moist weather. A large number of species have been studied, the best known being the gray, great gray, red, and black slugs. They are distributed in many lands and most species are preyed on by mammals and birds.

Slye (*slī*), MAUD, pathologist, born Feb. 8, 1879, in Minneapolis, Minn. She was educated at Brown Univ. and the Univ. of Chicago. From 1899-1905, she was professor of psychology and pedagogy at Rhode Island State Normal School. In 1911, she joined the staff of the Sprague Memorial Inst. for Medical Research at the Univ. of Chicago and later became a member of the pathology department. In 1919, she became director of the Cancer Laboratory there and soon became one of the leading figures in the field of cancer research. After many years of study of mice, she made important contributions to the knowledge of the factors of heredity and age in the incidence of cancer. Her written works include many on cancer as well as two volumes of poetry. She died in Chicago, Sept. 17, 1954.

Smallens (*smạl′ẹnz*), ALEXANDER, orchestra conductor, born in St. Petersburg, Russia, Jan. 1, 1889. Brought to the U.S. in infancy, Smallens was naturalized in 1919 and has made this country his home, except for two years of study at the National Conservatory in Paris (1909-11). His first post was that of assistant conductor for the Boston Opera Company (1911-14), and he has served successively as conductor of the Boston National Opera (1915-17), the Anna Pavlova South American tour (1917-19), the Chicago Opera Company (1919-22), opera companies in Berlin and Madrid (1923), the Philadelphia Civic Opera Company (1923-30), the Philadelphia Orchestra (1928-34), the Robin Hood Dell summer concert series in Philadelphia since 1930, and the Lewisohn Stadium summer concert series in New York City since 1934. He is also popular as the conductor of radio concerts.

Smallpox (*smạl′pŏḳs*), or VARIOLA, a highly contagious and infectious disease characterized by high fever and severe systemic symptoms followed by an eruption which passes through the stages of papule, vesicle, pustule, and crust (scab). The infectious agent is known to be a virus which is present in the lesions, especially the vesicles and crusts, and in exhalations. It is transmitted at first by infected droplets from the nose and mouth and later by contact with the cutaneous lesions or with articles handled by the sick.

The period of incubation after exposure is believed to be from 10 to 14 days, but in cases of direct inoculation of the virus the time is much shorter. A high fever, headache, chills, and muscle pains are the first manifestations of the disease. It is followed after three to five days by eruptions, which at first feel like small shot under the skin, but finally develop into serous infiltrations, called *vesicles*. The vesicles gradually increase in breadth, forming pustules, and by about the eighth day they break open. Shortly after they become covered by scabs. The number of pustules depends largely on the severity of the disease, ranging from only a few to many thousands. About the 21st day the scabs are completely gone, leaving blotches of a reddish-brown color for several months, and in many cases they become permanent pits in consequence of ulceration of the true skin.

Vaccination is a proved preventive. Vaccination and modern sanitary conditions have considerably lessened the occurrence of smallpox. Treatment includes strict isolation and quarantine (*q.v.*), and careful symptomatic and supportive measures.

Smeaton (*smē′tŭn*), JOHN, civil engineer, born near Leeds, England, June 8, 1724; died Oct. 28, 1792. He was the son of an attorney and gave early evidence of interest in mechanical pursuits. In 1742 he apprenticed himself to an instrument maker, setting up his own establishment in 1750. The following year he produced a machine for measuring a ship's path at sea and an improved form of the compass. He was made a member of the Royal Society in 1753 and two years later was entrusted with rebuilding the Eddystone Lighthouse, the completion of which, in 1759, won him the Copley medal. The lighthouse constructed by him remained intact until 1882, a period of 123 years, when a new structure took its place. Other notable works supervised by him include the Spurn Lighthouse, the Forth and Clyde Canal, the Perth and Banff bridges in Scotland, and extensive improvements in the Ramsgate harbor.

Smell (*smĕl*). See *Nose.*

Smelling Salts (*smĕl′ĭng sạlts*), a preparation consisting of an alcoholic perfume of pleasant and stimulating odor, usually lavender, with ammonium carbonate either in solution or as crystals. The ammoniacal odor acts as a restorative and stimulant in attacks of faintness and collapse, and gives relief in cases of catarrh. Smelling salts are a temporary expedient.

Smelt (*smĕlt*), a genus of fish of the salmon family, but differing from the salmon in having conical teeth on the jaws and tongue and on the tips of the vomer. Several species have been described. They are widely distributed, the American smelt being a common fish from New York to the northern coast of America. It has a greenish back and small scales and is about 8 in. long. It is valued highly as a food fish. The smelt ascends the rivers in the spring to spawn and in the summer returns to the ocean, but in some cases becomes land-locked in lakes. The smelts of Western Europe are somewhat smaller than the American species, but they are equally favored as food fishes. They abound in the North Sea and the Atlantic as far north as Norway.

Smetana (*smĕ′tä-nä*), BEDŘICH, or FRIEDRICH, composer, born in Leitomischl, Bohemia, March 2, 1824; died in Prague, May 12, 1884. He studied in Prague and in Pilsen and at the age of six appeared in public as a pianist. He knew Robert and Clara Schumann and was friendly with Franz Liszt, who exerted considerable influence on him. In 1848 he founded a school of music in Prague; meanwhile, he was active as a composer. He was the conductor (1857-61) of the Philharmonic Society of Gothenburg, Sweden. After a series of concert tours, he settled in Prague once again, and in 1863 he again opened a music school there. Under his direction (1866-74), the national theater in Prague gained world recognition. He wrote nine operas (one unfinished); the most famous is "The Bartered Bride" (1866), which has been produced all over the world. After 1874 he became totally deaf. Nevertheless, he composed a number of pieces during this period, among them two string quartets, "From My Life" (1876, 1882), and a cycle of six symphonic poems, "My Fatherland" (1874-79), which included the "Moldau" and "From the Fields and Groves of Bohemia." After a mental breakdown, he was put (1884) in an insane asylum, where he died that same year. Smetana is considered the originator of modern Czech music. Many of his works are based on traditional tales of his people.

Courtesy Culver Service, N. Y.

FRIEDRICH SMETANA

Smilax (*smī′lăks*), a genus of plants belonging to the lily family. It includes about 200 species, of which the greater number are climbing and trailing plants. They are widely distributed in the temperate and tropical parts of both hemispheres and include species that are useful in medicine and as food. About a dozen species are native to North America, including the greenbrier and carrion flower. Sarsaparilla (*q.v.*) is obtained from the rootstock of the smilax. A plant cultivated and known as smilax is a species of asparagus.

Smiles (*smīlz*), SAMUEL, author, born at Haddington, Scotland, Dec. 23, 1812; died Apr. 17, 1904. After completing a medical course in the Univ. of Edinburgh, he established a practice in his native town, but later abandoned medicine to become editor of the Leeds *Times.* He became secretary for the Leeds & Thirsk R.R. in 1845, and published miscellaneous writings. His best known work is a treatise on self-culture, entitled "Self-Help," which appeared in 1859. Another work is his "Life of George Stephenson," which resulted from forming the acquaintance of that noted engineer at Leeds in 1857.

Smith (*smĭth*), ADAM, political economist, born at Kirkcaldy, Fifeshire, Scotland, June 5, 1723; died in Edinburgh, July 17, 1790. His father was controller of the customs at the port of Kirkcaldy. He entered the Univ. of Glasgow in 1737, and, in 1740, was sent to Balliol Coll., Oxford. He remained at Balliol for six years, studying philosophy, literature, languages, and political sciences, and was appointed to lecture on literature and rhetoric at Edinburgh in 1748. Here he made the acquaintance of David Hume, who was to become a lifelong friend. Smith obtained a professorship in logic at the Univ. of Glasgow in 1751 and in the following year was given the chair of moral philosophy. Some of his lectures on natural theology, ethics, jurisprudence, and political economy (all could be included in moral philosophy at the time) were published after his death. During his years in Glasgow, he developed his ethical system and published his work on the "Theory of Moral Sentiments" (1759), asserting that moral sentiments arise from sympathy, which is the real bond between men.

ADAM SMITH

Courtesy Brown Bros., N. Y.

Adam Smith spent the years 1764-67 in Toulouse and Paris as tutor and companion to the Duke of Buccleuch. In Paris he met many of the distinguished 18th-century literary men and philosophers. He was greatly influenced by the *économistes,* or physiocrats, led by Quesnay. This group had developed a system of political economy based on the belief in the natural order of liberty.

Adam Smith returned to Kirkcaldy near the end of the year 1766 and set himself to the task of preparing his great work on political economy. He removed to London in 1773 to complete the final research and his classic masterpiece, "Inquiry into the Nature and Causes of the Wealth of Nations," appeared in 1776. Enjoying the company of such men as Edward Gibbon, the historian, Edmund Burke, the statesman, and the portrait painter, Sir Joshua Reynolds, he remained in London for two years. He then returned to Kirkcaldy to assume a position as Commissioner of Customs. He was elected lord rector of the Univ. of Glasgow in 1787.

The "Wealth of Nations" immediately attracted great attention and popularity, not because it was the first or even a completely original work on political economy, but because it translated into an interesting and systematic form the liberal economic tendencies which were fermenting in this period. In a sense, it rendered obsolete all previous treatises on political economy by pointing out altered industrial and commercial conditions and the necessity for new policies to fit a new industrial system. The mercantile system which had long prevailed in England and the rest of Europe was based chiefly on the power of national governments to control their economy. Adam Smith condemned stifling government restrictions and demanded the right of free enterprise and free trade. England was then on the verge of the industrial revolution and ready to enter on the first stage of the capitalistic system. It was this system, known as the domestic system, that Adam Smith analyzed, thus promoting the downfall of the antiquated economic processes of the mercantile system.

Smith, ALEXANDER, poet, born at Kilmarnock, Scotland, Dec. 31, 1830; died Jan. 5, 1867. He became a designer in a lace factory at Glasgow and while working began to take an interest in poetry. In 1853 he became well known for his book of poems, entitled "A Life Drama," and was soon made secretary of the Univ. of Edinburgh. Several of his books were published in conjunction with Sydney Dobell, with whom he was classed as a member of the "Spasmodic School." His chief works include "War Sonnets" (dealing with the Crimean War), "A Summer in Skye," and "City Poems."

Smith, ALFRED EMANUEL, politician, born in New York City, Dec. 30, 1873; died in New York, Oct. 5, 1944. He was educated in parochial schools, but he left school in the eighth grade. In 1892 he was hired as a checker in the Fulton Fish Market, a job he referred to often and proudly in later years. Smith's public career began in 1903, when he was elected to the state legislature, where he served consecutively for 12 years. In 1911 he became the leader of the Democrats in the legislature, two years later was chosen speaker, and in 1915 served as a delegate to the state constitutional convention. Withdrawing temporarily from state politics, he was elected sheriff of New York County, served two years, and in 1917 became president of the board of aldermen in New York City. He was elected governor in 1918, was defeated in 1920, but was re-elected in 1922, 1924, and 1926. As governor

ALFRED E. SMITH

Courtesy Brown Bros., N. Y.

he was instrumental in obtaining passage of much social legislation. He always opposed prohibition, and many believe that this stand, together with the fact that he was a Roman Catholic, brought about his defeat when he ran for the Presidency of the U.S. against Herbert Hoover in 1928.

After this election, he retired from public life, becoming president of the Empire State Bldg. corporation. From 1932-34, he was editor of the *New Outlook,* and from 1933 trustee of the Catholic Univ. of America. Although originally a staunch supporter of F.D. Roosevelt, he opposed Roosevelt's re-election in 1936 and thereafter. In October 1945, a nationwide drive was launched to raise funds for a 16-story Alfred E. Smith Memorial Wing for St. Vincent's Hospital, New York City. The completed building, with space for 160 beds, was dedicated by Francis Cardinal Spellman (*q.v.*) in 1950.

Smith, ANDREW JACKSON, soldier, born in Buckingham, Pa., April 28, 1815; died in St. Louis, Mo., Jan. 30, 1897. He was graduated from the U.S. Military Acad. in 1838 and served in the Mexican War. He was appointed a major general of volunteers in 1864, won the battle of Tupelo, Miss., July 14, 1864, and participated in the battles of Nashville and Mobile. He was appointed postmaster of St. Louis, Mo., in 1869.

Smith, BETTY WEHNER, writer, born in Brooklyn, N.Y., on Dec. 15, 1904. Educated at the Univ. of Michigan and the Yale Drama School, she later acted in stock and summer companies and for the Federal Theater. She edited several books of plays for amateurs and wrote original one-act plays. Her best-selling novel, "A Tree Grows in Brooklyn," the story of the childhood of the daughter of a poor Irish family in Brooklyn, was published in 1943; it was produced on Broadway as a musical in 1951. She also wrote the novels "Tomorrow Will be Better" (1948) and "Maggie-Now" (1958).

Smith, CHARLES EMORY, journalist and statesman, born in Mansfield, Conn., Feb. 18, 1842; died Jan. 19, 1908. He attended the Albany Acad. and Union Coll. at Schenectady, N.Y. He served in the Civil War and was editor of the Albany *Express* and later of the Albany *Evening Journal.* President McKinley appointed him Postmaster-General in 1898, after the resignation of James A. Gary. He continued as a member of the cabinet after the succession of Theodore Roosevelt to the Presidency, but retired in 1902.

Smith, DAVID EUGENE, educator and mathematician, born in Cortland, N.Y., Jan. 21, 1860; died July 29, 1944. In 1898 he became principal of the New York State Normal School. He was made professor of mathematics in Teachers Coll., Columbia Univ., in 1901 and professor emeritus after his retirement in 1926. He published a number of textbooks on elementary mathematics, edited the *Bulletin of the American Mathematical Society* from 1902-20, and was mathematical editor of the *New International Encyclopedia.* He published "Source Book in Mathematics" and other standard books in his field.

Smith, EDMUND KIRBY, soldier, born in St. Augustine, Fla., May 16, 1824; died Mar. 28, 1893. After being graduated from West Point Military Acad., in 1845, he became assistant professor of mathematics at West Point from 1849 to 1852. He was made a major in the U.S. Army in January 1861, but on the secession of Florida resigned his commission and joined the Confederate army. Efficient service brought about his promotion to the rank of lieutenant general in 1862 and the following year to that of general. He took part in the First Battle of Bull Run in 1861 and afterward fought at Richmond, Perryville, and Murfreesboro. In 1863 he was given command of the trans-Mississippi department, where he organized a government and established factories for supplying the troops with munitions of war. The following year he opposed and defeated Banks in the Red River campaign. His army was the last to surrender. He served as president of the Atlantic & Pacific Telegraph Co. from 1866 to 1868, was chancellor of the Univ. of Nashville from 1870 to 1875, and became professor of mathematics in the Univ. of the South, at Sewanee, Tenn., where he died.

Smith, FRANCIS HOPKINSON, artist and author, born in Baltimore, Md., Oct. 23, 1838; died Apr. 7, 1915. He received a good education, studied engineering, and for some time was an engineer in building public works. Some of his construction work was done under contracts with the U.S. government. Among his engineering works is the foundation for the Statue of Liberty (*q.v.*). As an artist he produced a number of excellent paintings, among them "In the North Woods" and "A January Thaw." His writings include "Well-Worn Roads," "Colonel Carter of Cartersville," "Tom Grogan," and "Old Lines in New Black and White."

Smith, SIR GEORGE ADAM, theologian, born in Calcutta, India, Oct. 19, 1856; died in 1942. He studied at the Univ. of Edinburgh and at New Coll., and subsequently took courses at the Univs. of Leipzig and Tübingen. After receiving his degree, he traveled in Egypt and Western Asia and served as instructor in Hebrew at the Free Church Coll. of Aberdeen, 1880-82. In the latter year he was made pastor of the New Church at Edinburgh, serving until 1892, when he was chosen professor of Hebrew in the Free Church Coll. of Glasgow. He visited America in 1903 and lectured extensively. From 1909-35 he was principal and vice-chancellor of Aberdeen Univ. His "Historical Geography of the Holy Land" was published in 1901. Among his other writings are "Commentary on Isaiah," "Preaching of the Old Testament to the Age," "Life of Henry Drummond," "Historical Atlas of the Holy Land," and "The Early Poetry of Israel."

Smith, GERRIT, capitalist, born at Utica, N.Y., Mar. 6, 1797; died Dec. 28, 1874. He was graduated from Hamilton Coll. and settled at Peterboro, N.Y., as manager of the large estate inherited from his father, Peter Smith, who was associated in the fur trade with John Jacob Astor. In 1852 he was elected to Congress, but refused to accept a re-election. He supported the Free Soil party, gave financial aid to John Brown, and was for several years governor of New York. In 1867 he joined Horace Greeley in signing the bail bond of Jefferson Davis. He published "Speeches in Congress," "Sermons and Speeches," and "The Religion of Reason."

Smith, GOLDWIN, educator and historian, born in Reading, England, Aug. 13, 1823; died June 7, 1910. He studied at Eton and Oxford, and in 1847 became a fellow of University Coll. As secretary of the Oxford Univ. Commission he compiled the government "Blue Book" on education in 1858, and in the same year became professor of modern history at that university, holding the position until 1866. He was a prominent champion of the Union cause in the American Civil War and visited the U.S. in 1864. On returning to England he published "England and America" and "Civil War in America," two works highly favorable to the North, and in 1868 resigned his chair at Oxford to become professor of English and history in Cornell Univ. at Ithaca, N.Y. In 1871 he moved to Canada and at different times edited the *Canadian Monthly*, the *Bystander*, and the *Week*. His writings include "Lectures on the Study of History," "Irish History and Character," "Specimens of Greek Tragedy," "Guesses at the Riddle of Existence," and "Political History of England."

Smith, HENRY BOYNTON, clergyman, born in Portland, Me., Nov. 21, 1815; died in New York City, Feb. 7, 1877. He was graduated from Bowdoin Coll. in 1834, studied theology at Andover and Bangor theological seminaries, and later attended the German universities of Halle and Berlin. From 1842 to 1847 he officiated as clergyman in the Congregational Church at West Amesbury, Mass., and in the latter year became professor of mental and moral philosophy at Amherst Coll. He was appointed to the chair of church history of Union Theological Sem. in New York City, in 1850, and four years later became professor of systematic theology in the same institution, a position he held for 20 years. He founded the *American Theological Review* in 1859, the *Presbyterian Review* in 1862, and the *Princeton Review* in 1871. Among his writings are "Introduction to Christian Theology," "History of the Church of Christ in Chronological Tables," and "System of Christian Theology."

Smith, JAMES, born about 1737 in Pennsylvania; died about 1814. He was captured by Indians in 1755 and was forced to live and travel with them until his escape four years later. After his escape he returned to Pennsylvania, where he became leader of the "Black Boys," a group of frontiersmen who undertook to defend settled communities against the Indians. In 1766-67 he was leader of an exploring party into Kentucky and Tennessee, the first group, except for Henry Scaggs, a hunter, to cross the Cumberland Mts. After the Revolutionary War he moved to Kentucky. He was a member of the state constitutional convention and, for many years, of the Kentucky legislature. He devoted the last years of his life to missionary ventures among the Indians and is the author of several accounts dealing with Indian history and customs.

Smith, JOHN, explorer and founder of Virginia, born in Willoughby, England, in January 1580; died in London, June 21, 1631. The eldest son of a tenant farmer, he ran away from home at the age of 15 to spend 10 years of adventure in Europe, Asia, and Africa. In 1605 he joined an expedition to explore and colonize Virginia, the expedition consisting of three vessels, 140 colonists, and 40 sailors. It reached the West Indies on Mar. 24, 1607, and, after sailing northward, lost its way, but was fortunately driven by a gale into the mouth of Chesapeake Bay. The mouth of the James River was reached on Apr. 26, 1607, and, after exploring the stream, the company selected a site for their capital, which they named Jamestown.

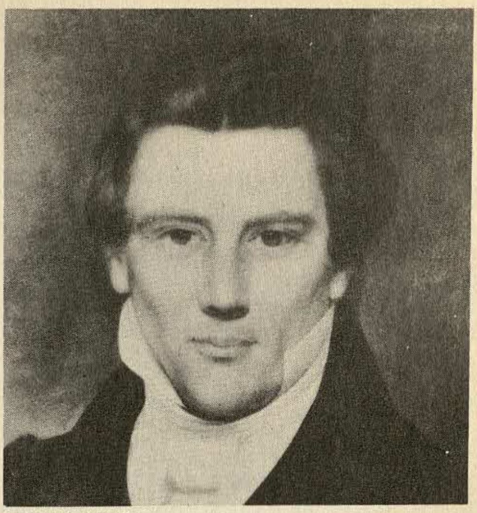
Smith had been charged with wanting to establish a kingdom in Virginia with himself as sovereign while the expedition was still en route, but after a trial he was acquitted and became the most active and important member of the new colony, making a number of important explorations. While in the Chickahominy region he was taken prisoner by Powhatan, but was saved from execution by Pocahontas (*q.v.*), daughter of that chief. In 1608 he made extensive explorations of Chesapeake Bay and the country surrounding it, of which he prepared a map of value to later settlers. However, the following year he was severely wounded by an accidental powder explosion and soon was obliged to return to England for treatment, being succeeded as governor of the colony by Lord Delaware.

Smith never visited Virginia again, but in 1610-17 he made extensive explorations in the regions now occupied by New England and southeastern Canada. In 1615 and 1617 he made two unsuccessful attempts to found settlements. He was buried in St. Sepulchre's Church, London. Among his writings are "Observations of

JOHN SMITH

Capt. John Smith," "General History of Virginia," "Description of New England," "Map of Virginia," "New England and the Summer Isles," "True Travels," and "A True Relation of Such Occurrences and Accidents of Note as Hath Happened in Virginia."

Smith, JOSEPH, founder of the Church of Jesus Christ of Latter-Day Saints, usually known as the Mormon Church, born Dec. 23, 1805, in Sharon, Vt.; murdered June 27, 1844, in Carthage, Ill. In 1823, according to his story, an angel appeared to him and told him of some gold plates buried in a nearby hill which had written on them the true gospel of the Lord. In 1827, after yearly recurrences of the vision, he dug up the plates, and in 1830 his interpretation of these documents was published as the "Book of Mormon." In the same year, on Apr. 6, he founded the Church of Jesus Christ of Latter-Day Saints in Fayette, N.Y. Together with his followers he moved west (1831) to Kirtland, O. There the church organization was developed and Smith became first president. In 1838, because of a financial scandal, the Mormons moved to Missouri, living in several communities before they finally went to Illinois, where they formed the community of Nauvoo. There they prospered and became an influential force in state politics until, in 1843, it was revealed that possibly Smith, and certainly some of the elders of the church, were practicing plural marriage. This discovery caused a division in the ranks of the Mormons and some of the dissenters published one issue of a dissensionist newspaper, the *Nauvoo Expositor,* before Smith suppressed it. The tidings it contained about polygamy incited a mob of citizens from neighboring communities to descend on Nauvoo. Smith was arrested and removed to the jail in Carthage, and there he was shot by the mob.



JOSEPH SMITH

The "Book of Mormon" and Smith's other principal work, "Doctrine and Covenants of the Church of the Latter-Day Saints" (1835), are the basis of the principal beliefs of the Mormon Church.

Smith, KATE, singer, born KATHRYN ELIZABETH SMITH, in Greenville, Va., May 1, 1909. She sang in a church choir at the age of four; at 17, without formal musical training, she won a part in the Broadway musical, "Honeymoon Lane." While singing a leading role in "Flying High," she began her longtime partnership with Ted Collins, who launched her (1931) on a career in radio. One of the most popular radio singers of the 1930's and '40's, she made famous her theme song, "When the Moon Comes Over the Mountain." She appeared on a television series in the early 1950's and, after several years in semiretirement, returned to TV in 1960.

KATE SMITH

Smith, LILLIAN, author, born in Jasper, Fla., in 1897. Educated at Piedmont Coll. (Georgia), the Peabody Conservatory of Music in Baltimore, and Columbia Univ., she spent three years as a teacher in Huchow, China, returning to the U.S. in 1924. From 1936 to 1945 she was co-editor of the liberal magazine *South Today*. In 1944 appeared her first successful novel "Strange Fruit," dealing with the tragic love of a Negro woman and a white man in the South (dramatized, 1945). "Killers of the Dream" (1949) is an analysis of Southern race relations. She published her autobiography, "The Journey" (1954), also "Now Is the Time" (1955) and "One Hour" (1959).

Smith, LOGAN PEARSALL, essayist, born in Philadelphia, Oct. 18, 1865; died in London, March 2, 1946. Smith was educated at Harvard and at Balliol Coll., Oxford, and became a naturalized British citizen. Many of his critical and autobiographical essays are to be found in "The Youth of Parnassus" (1895), "The English Language" (1912), "Trivia" (1918), "More Trivia" (1921), "Words and Idioms" (1925), "On Reading Shakespeare" (1933), "Reperusals and Recollections" (1936), "Unforgotten Years" (1938), and "Milton and His Modern Critics" (1940). A prominent classicist, and one of the foremost literary critics of his day, Smith was admired particularly for his deft and graceful style.

Smith, MARGARET CHASE, U.S. Senator, born in Skowhegan, Maine, Dec. 14, 1897. Educated in Maine, she taught school and later worked as a newspaperwoman. Entering politics in 1930, she was elected to Congress in 1940 and to the Senate in 1948, becoming the first woman Senator from Maine. The Senate passed a resolution (June 15, 1961), honoring her unparalleled record of participation in 1,000 consecutive roll-call votes.

Smith, SAMUEL FRANCIS, clergyman and author, born in Boston, Mass., Oct. 21, 1808; died there Nov. 16, 1895. After being graduated from Harvard Univ. and Andover Theological Sem., he became pastor of the Baptist Church in Waterville, Maine, in 1832, and taught modern languages there, at Colby Coll., 1834-42. In 1842 he moved to Newton, Mass., where for six years he edited the *Christian Review*. Smith wrote many hymns. The most familiar is "America" (known also as "My Country, 'Tis of Thee"), which he wrote in 1832 while a student at Andover.

Smith, SYDNEY, author, born in Essex, England, June 3, 1771; died in London, Feb. 22, 1845. After studying at the Winchester School and Oxford Univ., he became curate of Amesbury, in Wiltshire, and later served at Edinburgh. In 1802 he joined several others in establishing the *Edinburgh Review*, a periodical that marks an epoch in literary criticism. The following year he moved to London, where he attained a wide acquaintance as orator and lecturer, and in 1831 was given a prebendary at St. Paul's Church. His writings include chiefly religious and political works, through which runs a vein of pleasantry. Smith is remembered as one of the great British wits, and his wit and his criticism jointly had a great influence on contemporary thought in England.

Smith, WALTER BEDELL, general and diplomat, born in Indianapolis, Ind., Oct. 5, 1895; died in Washington, D.C., Aug. 9, 1961. He served in the Indiana National Guard (1910-15), was commissioned in the Officers Reserve Corps (1917), and was graduated from the Infantry School (1930). He then advanced through the grades to general in 1951. He served as secretary of the U.S. joint chiefs of staff (1941-42). He was Gen. Dwight D. Eisenhower's chief of staff, a post he held during operations in North Africa and in Europe, and signed the German surrender document for the Supreme Allied Command, May 6, 1945, at Reims, France.

WALTER BEDELL SMITH

After World War II (*q.v.*), Smith served as U.S. ambassador to Russia (1946-49) and director of the U.S. Central Intelligence Agency (1950-53). He was Under Secretary of State from 1953 to 1954, when he retired from government service to become an executive of the American Machine and Foundry Co.

Smith wrote "My Three Years in Moscow" (1950) and "Eisenhower's Six Great Decisions: Europe 1944-45" (1956).

Smith, WILLIAM, geologist, born at Churchill, England, March 23, 1769; died at Northampton, Aug. 28, 1839. A civil engineer, he took up the study of soils and rocks and made a number of maps showing the order of succession in the geological strata. His geological map of England and Wales required about 15 years, and he afterward supplemented it with separate maps of the counties. This work was the first map of the kind to be issued for England. He is generally regarded as the father of English geology.

Smith, WILLIAM FARRAR, soldier, born in St. Albans, Vt., Feb. 17, 1824; died in Philadelphia, Pa., Feb. 28, 1903. He was graduated (1845) from the U.S. Military Acad., where he was made an instructor in mathematics. In the Civil War he became a major general and chief engineer of the department of the Mississippi, and later served as police commissioner of New York City.

Smith, WILLIAM ROBERTSON, theologian and Orientalist, born in Keig, Scotland, Nov. 8, 1846; died in Cambridge, England, March 31, 1894. The son of a Free Church member, he studied in Edinburgh, Bonn, and Göttingen. In 1870 he became professor of Hebrew in the Free Church Coll. of Aberdeen but was suspended, and later dismissed, for rejecting the Mosaic authorship of the Book of Deuteronomy. During his suspension he traveled in Egypt and Arabia and afterward lectured on theology and Bible history. In 1881 he became an associate editor of the "Encyclopaedia Britannica" and on the death of T. Spencer Baynes, in 1887, was made editor-in-chief. Smith wrote many books on religious subjects, including "The Prophets of Israel and Their Place in History."

Smith, SIR WILLIAM SIDNEY, admiral, born at Westminster, England, July 21, 1764; died in Paris, France, May 26, 1840. At the age of 11 he entered the navy to participate in the American war. His courage and enterprise earned him a captaincy at 18. After an active career, during which he spent two years in French prisons, he was sent to Constantinople in 1798. While there, he learned that Napoleon intended to attack St.-Jean d'Acre (see *Acre*) and hastened to its relief. After capturing a number of French vessels on March 16, 1799, he successfully defended the town and forced Napoleon to raise the 61-day siege and retreat in disorder. This brilliant exploit won him the thanks of Parliament and a pension of £1,000 a year. Under Sir Ralph Abercromby (1734-1801), he commanded the naval brigade at the Battle of Aboukir (*q.v.*), where he was wounded. He was elected to Parliament from Rochester in 1802, served with distinction in Sicily and Naples in 1805, and was promoted to the rank of admiral in 1821. The later years of his life he spent mainly in Paris.

Smith Act (*smĭth ăķt*), popular name for the Alien Registration Act (*q.v.*) of 1940 (particularly Title I, Sec. 2a and 3). These sections provide that "it shall be unlawful for any person to knowingly . . . teach the duty, necessity, desirability, or propriety of overthrowing or destroying any government in the United States by force and violence," or to publish or distribute any printed matter, or to organize any group, which advocates such purposes. This act was designed to control subversive elements in the U.S., particularly Fascists, Communists, and their sympathizers. Under its provisions, the top leaders of the Communist party were convicted (Oct. 14, 1949) of conspiracy, fined $10,000 each, and sentenced to three- or five-year jail terms. The constitutionality of the act was affirmed by the U.S. Supreme Court (6-2, Justice Clark abstaining) on June 4, 1951. See also *Communism*.

Smith College (*smĭth ķŏl'ĕj*), an educational institution for women at Northampton, Mass., founded in 1871. It is named after Sophia Smith, who founded the institution and made a bequest to it of $400,000. Students who complete the undergraduate course receive the degree of Bachelor of Arts. The college also offers work leading to the degree of Master of Arts and other equivalent degrees. The degree of Doctor of Philosophy is conferred occasionally. The faculty numbers approximately 250 members, and the student body *ca.* 2,300. During World War II the U.S. Navy established its Officers Training School for WAVES and the Naval Reserve Midshipman's School (WR) on the campus, and thousands of officers of the WAVES were trained and commissioned there.

Smithfield (*smĭth'fēld*), originally a six-acre tract of land in London, England, lying north of Newgate and west of Aldersgate. It was an open spot and was used for some centuries as the archery, tournament, and playing field of the citizens of London. Part of the area served as a hay and livestock market (1150-1855). In 1868 much of the area was built over by the Central Meat Market, to which the modern use of "Smithfield" usually refers, though some space still exists as a park. Smithfield served as the seat of the Bartholomew Fair (*q.v.*) and as a place of execution, most memorably for the execution of Protestant martyrs during the reign of Mary Tudor (Mary I, *q.v.*). Charles Dickens mentions it in his "Oliver Twist."

Smithson (*smĭth'sŭn*), JAMES, scientist, born in France about 1765; died in Genoa, Italy, June 27, 1829. He was a son of Hugh Smithson, first Duke of Northumberland, and was educated at Pembroke and Oxford. He was ardently interested in chemistry and numerology, and in 1787 was made a fellow of the Royal Society. He spent most of his life on the Continent. His fortune of more than $500,000 was left to his nephew, Henry James Hungerford, with the stipulation that if the legatee should die without issue the entire amount should be used to found an institution at Washington, D.C., for "the increase and diffusion of knowledge among men." Since Hungerford died childless, the bequest was transferred to the U.S. It has

JAMES SMITHSON

never been authoritatively established why Smithson made this stipulation; he had never set foot on American soil. See *Smithsonian Institution.*

Smithsonian Institution (*smĭth-sō′nĭ-ạn*), a scientific institution in Washington, D.C., established by act of Congress in 1846. This institution owes its origin to James Smithson (*q.v.*), who, by the terms of his will, gave an estate worth $550,000 to the U.S. government "to found at Washington, under the name of the Smithsonian Institution, an establishment for the increase and diffusion of knowledge among men."

The original bequest has been enlarged by additional gifts totaling nearly $3,000,000. The institution also administers the Freer bequest of more than $8,000,000, as well as annual government appropriations for the bureaus under its direction of more than $1,500,000. The governing body is a board of regents composed of the Vice President, the Chief Justice of the U.S., three representatives appointed by the speaker of the House, three senators appointed by the Vice President of the U.S., and six citizens chosen by Congress. The general management is largely under the direction of the secretary. Its several buildings are located in the south part of the Mall, a short distance east of the Washington Monument.

The institution carries on researches in biology, geology, anthropology, and astrophysics, as well as scientific explorations in all parts of the world. Bureaus of the institution include: the U.S. National Museum, the Bureau of American Ethnology, the Astrophysical Observatory (probably the only observatory devoted exclusively to the study of the sun), the Division of Radiation and Organisms, the National Zoological Park, the National Gallery of Art (Andrew Mellon's gift), and the National Collection of Fine Arts, including the Freer Gallery of Art.

Smog (*smŏg*). See *Smoke.*

Smoke (*smōk*), an aerosol consisting of very small particles of a solid suspended in air. In a more general sense the term is applied to dispersions of both solids and liquids in gases. (A dispersion of liquid particles in air is called a fog, while a system composed of both solid and liquid particles is called a "smog.") The individual particles of a smoke are of such a size that they may not be seen with the unaided eye. If a system is viewed with a powerful microscope using strong illumination at right angles to the axis of vision, one may see small points of light scattered from the smoke particles themselves. The latter, however, are too small to be seen. The points of light may be observed to undergo irregular, continuous motion, usually called Brownian motion, after the first observer of the phenomenon. The smoke particles may be irregular of spherical in shape, depending on whether they are solid or liquid. They are practically always electrically charged as a result of the way in which they were formed.

Although there is a great variety of smokes, they may be conveniently classified into two convenient groups: (1) industrial waste smokes and (2) synthetic smokes. The latter may serve a variety of useful purposes, while the former group always presents civic, economic, and sometimes physiological problems.

Industrial smokes are usually produced by a burning or grinding operation. Wood, coal, and petroleum when burned usually form smokes as a result of incomplete combustion. Tarry products, carbon (known as soot), and water in varying proportions are usually the constituents of smoke. Large clouds of such smokes may be produced around industrial centers such as Pittsburgh or East St. Louis and present a real problem. A number of different efforts have been made to precipitate such smoke or to remove it in other ways from the atmosphere. One of the most successful of these is the Cottrell Precipitator. It takes advantage of the fact that the particles are electrically charged, and consists of a long wire suspended in the smokestack (chimney). This wire is connected to one terminal of a high-voltage source and the smokestack is connected to the other. The particles of smoke, being electrically charged, migrate to the smokestack wall or the wire (depending on which has a charge opposite to that of the particle) and precipitate or settle out there. Perhaps the best solution to the problem of such smokes, however, is to prevent their formation rather than to attempt to remove them once they are formed. This can usually be done by increasing the oxygen supply in the combustion process.

Synthetic smokes are produced in various ways and used for diverse purposes. Meats are sometimes dried and seasoned by passing smoke over them; the American Indians employed smoke signals in a system of communications; and more recently smoke screens have played a vital role in military and naval operations.

Military and naval smokes are usually produced by spraying operations which may or may not be followed by a chemical reaction. For smoke screens at sea or in humid atmosphere, silicon tetrachloride ($SiCl_4$) has been used in the form of a spray. The substance is unstable and, on coming in contact with water, hydrolyzes to give silicon dioxide (SiO_2, or sand) and hydrochloric acid. Droplets of this mixture are slow in settling and have a high refractive index and therefore are very effective for screening purposes. Some smoke screens have been made from heavy, high boiling oils. These have the advantage of being harmless to clothing and, since they have a high boiling point, the particles do not evaporate easily. Burning phosphorus also produces dense white fumes which may be used for screening purposes.

Screening smokes are usually transparent as far as the individual particles are concerned, but their obscuring power is due to the ability of the particles to scatter (bend or refract) light rays, and this in turn depends on the refractive index (speed of light in the particle compared to its speed in air) of the particle. The transparent smokes may also manifest interesting colors in daylight. If the particles making up the system are very small compared to the wave-length of the light, the smoke will appear red if the light transmitted through a thin section of the smoke is observed, but if the laterally scattered light is observed, it appears blue. This is due to the fact that the small particles scatter short wave-lengths (blue, violet), while permitting the long wave-lengths to pass without much hindrance. If, however, the particles of smoke are large compared to the wave-length of the light, the system will merely appear gray or white in all directions since, under these conditions, there is no selective scattering. (All wave-lengths of the white light are affected to the same extent.)

The color of a smoke depends not only on the particle size of the individual particles but also on the nature of the chemical substances present. Some of these may be very characteristic and serve as a means of identifying the sort of chemical agent producing a given smoke. This means was used effectively in identifying camouflaged war plants during World War II. Identity was established by taking a colored aerial photograph of the plant and studying the picture of the smoke as to color, density, and form.

The breathing of various smokes has been employed from ancient times as a pleasurable pastime. Tobacco and opium smokes are used for this purpose, as is that of marihuana. The former is of uncertain permanent influence physiologically, while the two latter have definitely harmful, lasting physiological effects and their use is outlawed in most modern countries.

A recent development in the application of smokes is their use as carriers for insecticides (*q.v.*) and fungicides. D.D.T., the powerful insect killer, may be employed in this way. See also *Chemical Warfare.*

Smokeless Powder (*smōk̦′lĕs pou′dēr*), an explosive that acts without the production of much smoke, used chiefly for military purposes. About 50 per cent of ordinary gunpowder is made up of finely divided solids, but smokeless powders develop wholly gaseous products in the course of combustion. Besides being partly or entirely smokeless, these powders are more valuable than black gunpowder because they impart to projectiles higher velocities. They are prepared by the dissolution of gun cotton and nitrocellulose in ether, after which the compound is dried into a hornlike substance. The nitrocellulose used in this process of manufacture is prepared by soaking wood pulp or sawdust in a solution of nitric acid, or nitric and sulphuric acids. When fully hardened by drying, the product is prepared for use by separating into flakes or grains by machines. In some varieties cellulose nitrate is mixed with nitroglycerin, or with nitro derivatives of hydrocarbons, such as picric acid. The ingredients depend upon the maximum initial velocity desired. See also *Gunpowder.*

Smokies (*smō′k̦êz*), SMOKY MOUNTAINS, or GREAT SMOKY MOUNTAINS, part of the western Appalachian chain, forming the boundary between North Carolina and Tennessee. The highest peaks are Clingman's Dome, Mt. Le Conte, and Mt. Guyot, rising over 6,000 ft. Their picturesque beauty, with high peaks and deep gorges, makes the Smokies a favorite stopping place for tourists, and there are many winter resorts and hotels nearby.

Smolensk (*smŏ-lyĕnsk̦′*), a city of Russia, capital of the administrative district of Smolensk, on the Dnieper, 260 m. s.w. of Moscow. It is surrounded by massive walls, but they are not maintained in a good condition for defense. The principal buildings include the Cathedral of Uspenski, the museum, the public library, the episcopal palace, and a number of educational and industrial institutions. It has railroad facilities and a large trade. Principal industries include copper and iron smelting, lumbering, and the manufacture of textile machinery. Smolensk has played a large part in Russian history, having been, as early as the 11th century, the center of a principality that included the dependency of Moscow.

In later centuries this position was reversed, and possession of Smolensk was long disputed among Moscow, Lithuania, and Poland. After numerous shifts, the city became a part of Poland until 1654, when it was annexed to Russia: It was the scene of a battle between the French and Russians in 1812, when the former wrested control of the district. During World War II the city again became a center for military operations, being captured by the Germans July 18, 1942, and retaken by the Russians on Sept. 25, 1943. Population, *ca.* 160,000.

Smollett (*smŏl'ĕt*), TOBIAS GEORGE, historian and novelist, born in Dalquhurn, Scotland, in 1721; died near Leghorn, Italy, Oct. 21, 1771. He was descended from a distinguished Scottish family, studied at the Univ. of Glasgow, and was afterward apprenticed to a surgeon in that city. It was his early intention to practice medicine, but his medical study gave way to interest in literature, and in 1740 he went to London to secure a publisher for a tragedy entitled "The Regicide." Failing in this, he became a surgeon's mate on an expedition to Cartagena. This afforded an opportunity to study the varied life of a seaman, which he wrote about in "The Adventures of Roderick Random," in 1748. He was editor of the *Critical Review* from 1756 to 1759, but was imprisoned for publishing criticisms on the government in relation to barbarities in Scotland and elsewhere. Smollett was a genial and humorous writer, and his books have been widely translated. His last years were spent at Monte Novo, near Leghorn, where he went for his health. He died there and, like Fielding, was buried in a foreign land. Among his numerous writings are "Peregrine Pickle," "Adventures of Ferdinand," "History of England," "A Tour in France and Italy," "Adventures of an Atom," "Tears of Scotland," and "Humphrey Clinker." He made a translation of "Don Quixote."

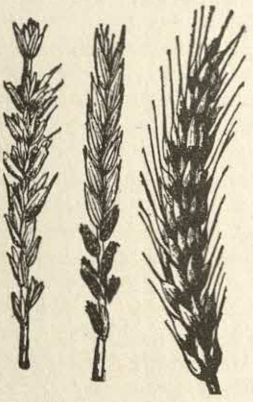
Smoot (*smōōt*), REED, legislator and Mormon leader, born in Salt Lake City, Utah, Jan. 10, 1862; died Feb. 9, 1941. Active in the affairs of the Mormons, Smoot was elected an apostle of the Church of Jesus Christ of Latter-Day Saints in 1900. Three years later he was made U.S. Senator from Utah (1903-33). He became prominent in the senate and served on the public lands, surveys, appropriations, and rules committees of that body. As a recognized authority on finance and government expenditures, he was chairman of the senate finance committee and a member of the World War Foreign Debt Commission (1922). He did important work on many tariff bills and was senate sponsor for the tariff act of 1930, which is called the Smoot-Hawley Tariff Act.

Smuggling (*smŭg'lĭng*), the offense of importing or exporting merchandise in violation of statutory law. The practice generally arises from imposition of restrictive commercial regulations and of high duties which make it particularly profitable to evade payment of such duties. The strict trade measures imposed upon the early American colonists by the English Parliament led many merchants of this country to indulge in smuggling. During the early 19th century, American embargo and nonintercourse acts resulted in considerable illicit trade with the West Indies.

Smuggling today is generally in articles of luxury. The U.S. specifically provides punishment for the act, imposing up to a $5,000 fine or a prison term or both. It is necessary, however, to prove intent before a conviction can be secured. For concealing objects from the customs inspector, persons are fined treble the value of the objects.

Prohibition brought an era of liquor smuggling, known popularly as bootlegging. With imposition of more stringent immigration laws, smuggling of aliens into the country also became more or less common. The "underground railroad" of pre-Civil War days carried on a sort of smuggling practice, assisting runaway slaves over the border into Canada.

Smut (*smŭt*), or DUSTBRAND, a disease induced in higher plants by parasitic fungi. It is found frequently in the ears of corn, barley, oats, and rye, and sometimes in wheat. Smut usually appears as a black, sootlike powder, into which the grain and its integuments are converted. In some instances it affects various parts of the plant, especially in corn. When examined by a microscope, the black powder is found to consist of round spores, but these are so minute that many thousands of them can be placed on a square inch of surface. The smell is not disagreeable, as in some of the allied fungi. No remedy or preventive is known. Corn is infested by a remarkable kind, the ears and tassels sometimes assuming a very large size. It is thought advisable not to select seed corn from plants growing in the vicinity of infected stalks.

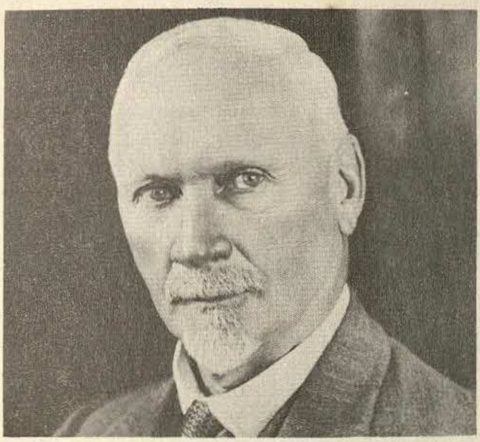


HEADS OF WHEAT

Showing a healthy head and the effects of smut in the other

Smuts (*smŭts*), JAN CHRISTIAAN, soldier and statesman, born May 24, 1870, in Cape Colony, South Africa. After studying law at Cambridge

Univ., he returned to South Africa, where he was named state attorney of the South African Republic in 1898. He served on the side of the Dutch during the Boer war, rising to the rank of general. In 1904, together with Gen. Botha, he formed a People's party, which won its first election in 1907. Botha then became premier and Smuts served under him as colonial secretary and minister of education. After the country became the Union of South Africa, an achievement which Smuts played an important role in attaining, he served in several important positions. After Botha's death in 1919 he succeeded to the premiership, remaining in office until 1924. He returned to the government in 1933 as minister of justice, a post he held until 1939, when he was again chosen premier, as well as minister of external affairs and defense. A staunch supporter of the British Empire, he was instrumental during World War I in keeping his country from an effort to win independence. During both World Wars he was an ardent supporter of the Allied cause. His highest goal, however, was World Peace, and he played an important part in establishing both the League of Nations and the United Nations. In 1946 he appeared before the U.N. General Assembly to defend his country's right to annex South West Africa. In 1948, defeated in a Parliamentary election, he resigned the premiership, and died two years later at Pretoria, Sept. 11, 1950. His writings include "The League of Nations: A Practical Suggestion" (1918), "Holism and Evolution" (1926), "Africa and Some World Problems" (1930), "Plans for a Better World" (1942).



Courtesy Union of South African Info. Office, N. Y.

JAN CHRISTIAAN SMUTS

Smyrna (*smẽr′nȧ*), or IZMIR, a seaport city in Asia Minor, on a gulf of the same name, now one of the largest cities in Asiatic Turkey. The Gulf of Smyrna, formerly the Hermaean Gulf, is an inlet of the Aegean Sea, on which the city has a secure harbor. Several productive islands are at its entrance and it extends inland about 40 m. The city is built partly on the plain at the shore of the gulf and partly on sloping hills.

Smyrna has many mosques, bazaars, churches, synagogues, hospitals, and government institutions. The population is very diversified, many nationalities being represented. A city of ancient origin, Smyrna claims the honor of being the birthplace of Homer and other great Greeks, but nothing definite is known beyond the 7th century B.C., when it was occupied by Ionian exiles, who later joined it to the Ionian League. The Lydians destroyed it in 630 B.C., but it regained its importance under the Romans and for many years rivaled Byzantium. It was destroyed by an earthquake in 178 A.D., but Marcus Aurelius rebuilt it soon after. Tamerlane massacred its people, in 1402, and in 1424 it became a Turkish possession. Smyrna became Greek territory in 1919, but the Greeks were ousted by the Turks in 1922. Population, *ca.* 200,000.

Smyth (*smĭth*), HENRY DE WOLF, physicist, born in Clinton, N.Y., May 1, 1898. He studied at Princeton Univ. before going to Cambridge Univ., England, as a National Research Council fellow. After receiving his Ph.D. from Cambridge, he returned to teach at Princeton, and became head of the physics department in 1935. In 1940, he was made a consultant on war research projects to the National Research Council and to the Office of Scientific Research and Development. Smyth was one of the scientists who worked on the development of the atomic bomb, and he wrote the official army report on atomic energy, "Atomic Energy for Military Purposes" (1945). His other publications include a number of articles for scientific journals and one book, "Matter, Motion, and Electricity" (1939).

Snail (*snāl*), in a broad sense, any one of various mollusks having a spiral shell, into which it withdraws for protection. The species are numerous, inhabiting most parts of the world, and can be found in the sea, fresh water, and the land. The land snails are the most familiar, both because some of them are extensively used as food and because in some places they effect considerable damage to garden vegetables and tender plants. The land snails have four tentacles or feelers on the head, which can be extended or withdrawn, the two longer being provided with eyes. The mouth has numerous rows of small teeth, while the tongue is long and narrow and also bears teeth. The body is of elongated form, having on the lower side a muscular foot or sole, by means of which it creeps or glides along, carrying the shell on its back. Snails chiefly inhabit damp places protected from strong sunlight; they are most active at night.

Courtesy Publicity Associates, N. Y.

SNAKE CHARMER

They close their shell with hardened mucus at the approach of winter, or in seasons of drought, and become inactive or torpid. When the shell and the soft parts are slightly injured, nature repairs them with remarkable completeness. European land snails are exported for American markets in considerable quantity, as the American species are small and not useful for food. The edible snail was a favorite article of food among the ancient Romans, and in France and other countries of Europe it is cultivated for the market. It is found commonly under logs or rocks where it conceals itself to pass the winter. Snails differ from slugs (*q.v.*) in that the body of the slug is unprotected by a shell.

Snake Charming, the art of influencing vicious and poisonous snakes to the extent that they may be handled without danger. The practice of charming snakes is of great antiquity, and was undoubtedly first practiced by daring persons who sought to inspire awe or gain advantages over the chiefs or their tribe. It is a part of some exhibitions, in which it is practiced to entertain or amuse the spectator. Many people of Asia travel from place to place and make their living by giving entertainments as snake charmers. Those who practice the art influence the snakes by use of the eye, by touch, and in some cases by whistling. In many instances the snakes are first rendered harmless by extracting the fangs.

Snake River (*snāk rĭv′ẽr*), the largest tributary of the Columbia. It rises among the Rocky Mts. of western Wyoming and, after a general course toward the northwest, joins the Columbia a short distance north of Wallula, Wash. The Snake River forms a semicircle in flowing through southern Idaho and comprises part of the boundary line between Oregon and Idaho and between Washington and Idaho. Among the principal tributaries are the Salmon, Payette, Clearwater, Boise, and Owyhee Rivers. The celebrated Shoshone Falls (*q.v.*) are on its course in southern Idaho and, after receiving the Salmon River, it forms the Salmon Falls. The entire length is about 900 m., but only 160 m. are navigable.

Snakeroot, the name of several plants native to North America, so called from the belief that they are useful as remedies in treating snake bites. They are distributed in many parts of Canada and the U.S. A species known as *Canada snakeroot* is found in New England and is known for its fragrance and tonic properties. *Black snakeroot,* or *sanicle,* has a root with an aromatic taste and properties of some value for antispasmodic purposes. *Seneca snakeroot* grows throughout most parts of the U.S. and from its root is prepared the drug known as *seneca.* It is an acrid irritant and is used by physicians in making cough mixtures for treating respiratory catarrhs.

Snakes (*snāks*), members of the reptilian suborder *Serpentes* (or *Ophidia*), possessing an elongated body that is covered with horny scales. All lack functional limbs, although a few, such as the boas and pythons, have small vestiges of hind limbs. Snakes lack movable eyelids and external ear openings. In this suborder the bony elements of the two sides of the lower jaw are connected in front by a flexible ligament. All snakes are carnivorous, feeding on a wide variety of invertebrate and vertebrate animals. Snakes are either oviparous or ovoviviparous in reproduction. The eggs and young receive little parental attention. A few species guard the eggs during development, but this seems to be the exception rather than the rule. In ovoviviparous species the young usually shift for themselves within a few hours after they emerge from the mother.

Snakes are most closely related to the lizards and with this group comprise the largest and most diverse order of living reptiles, the order *Squamata.* There are an estimated 5,000 species in this order, of which the snakes constitute half. The fossil history of the snakes is little known, but it is certain that they are descendants of the closely related lizards. The earliest recognizable snake fossil is from the Cretaceous Period, approximately 100,000,000 years ago.

Living snakes are found on all continents of the world with the exception of Antarctica, and on many of the larger island groups within the tropical and temperate regions. The greatest number of species is found in the tropics, and the number of species decreases poleward, with only one species, the adder of Europe, reaching the southern limits of the Arctic Circle. One family, the *Hydrophiidae,* is adapted to life in the seas, and occurs in the Pacific and Indian Oceans from the west coast of Central America to the east coast of Africa. Snakes that occur in cold regions are forced to hibernate in places protected from the frost. Such places are called "dens," and snakes may be found in large numbers around these "dens" in the early spring and late fall.

Snakes occur in many different environments and exhibit a wide variety of adaptations. Many structural modifications are correlated with the different habits and habitats. For example, in the sea snakes that live in a marine habitat the tail is flattened laterally like a rudder, the nostrils are situated on the top of the head and are closed by means of a valve, and the ventral scales that aid the terrestrial species in crawling are much reduced. Snakes vary in length from the largest constrictors that attain a maximum length of slightly over 33 ft. to the smallest blind snakes that never reach a length of 12 in.

The agility displayed by snakes despite the absence of functional limbs is a source of considerable interest. Movement over the ground is accomplished by two main methods of locomotion, with a third highly specialized method found in a few desert species. The two common methods of locomotion are: the "caterpillar movement," in which the snake crawls in a straight line through the motion of the ribs and the ventral plates; and the "lateral undulatory movement," in which the snake progresses by means of a series of S-shaped movements. In addition to the two methods described above, a few desert species utilize a third method of locomotion over loose sand. This is a complicated movement called "side-winding." Great speed is frequently attributed to snakes, but scientific experiments credit the fastest species with a speed of only about 4 m. per hour.

One of the most interesting developments in snakes is that of an effective venom for killing food organisms. There are three different modifications in tooth structure that facilitate the injection of the venom. In one type the rear teeth of the upper jaw are enlarged and grooved. Snakes possessing this type of modification are referred to as opisthoglyphs, and with the exception of the boomslang of Africa are not dangerous to man. In the second type of modification the front teeth on each side of the upper jaw are elongate and hollow, like a hypodermic needle. The enlarged teeth or fangs are immovably attached in the upper jaw. The snakes with this type of modification are termed the proteroglyphs and include two of the four families of important venomous species. The two families of proteroglyph snakes are: the *Hydrophiidae* or sea snakes; and the *Elapidae*, including the cobras, mambas, coral snakes, and others. This latter family is the largest family of important venomous snakes, containing approximately half of the known species of front-fanged snakes. A further development of interest is found in a few proteroglyphs. This is the ability to "spit" or eject the venom in a fine spray, providing an effective defense technique. This is found only in a few cobras and in the ringhals of the Old World. The last type of modification in tooth structure is similar to that found in the proteroglyphs, but the fangs are larger, more elongate, and attached to a movable bone in the upper jaw. Snakes with this type of modification are called the solenoglyphs, and include the two remaining families of important venomous species: the *Viperidae* or true vipers of the Old World; and the *Crotalidae* or pit vipers of the Old and New Worlds, including the rattlesnake, copperhead, bushmaster, fer-de-lance, and others. These four families of front-fanged snakes include approximately 20 per cent of the known species of snakes, but only a small number of these species are dangerous to man.

Snake Worship, or OPHIOLATRY, a form of religious worship. It dates from remote antiquity, and is still practiced to a considerable extent in India and among many savage and semicivilized peoples. Snake worship is considered quite closely associated with tree worship, which, as a form of religion, rose from the fact that most races of mankind at a certain stage of mental development held the view that trees are the residences or embodiments of spirits or deities. Both are forms of nature worship, against which stern denunciations were made by the Jews, and in classical mythology there is wide mention of sylvan deities, elves, and fairies more or less associated with snakes and trees. Homer mentions the appearance of a snake at the siege of Troy as an omen of victory to the Greeks, while Plutarch speaks of Alexander as having come from a snake race. The Zulus of South Africa bring snakes into their homes, giving them the most devoted protection. Many American Indians practiced snake worship in varied forms.

Snapping Turtle (*snăp′ĭng tûr′t'l*), the name of a tortoise found in the fresh waters of North America, so called from its fierceness in defending itself against its enemies. The body is usually about 20 in. long, though it sometimes exceeds 3 ft. The tail is long and the head is snakelike, but the shell is too small to permit either to be entirely covered. It has jaws of great strength and is capable of holding itself so firmly to the object it bites that it is pulled or lifted from the ground. A species known as *alligator snapper* is found in the lower basin of the *Mississippi*. The female deposits about 30 eggs in June, digging for that purpose holes in a sand bank with its hind feet. The eggs are about 1 in. in diameter, white in color, and nearly globular.

Snipe (*snīp*), a genus of wading birds. They are common to America and Europe, frequenting the regions along the shores of rivers and lakes and the marshy places. The *American*, or *Wilson's*, snipe is found in large flocks, especially in marshes, and is a favorite for the fine flavor and nutritious quality of its flesh. It is about 10 in. long, has strong legs, and the long, slender bill is well adapted to search for insects and mollusks under the water. The color is brownish-black above and whitish below and the voice is a peculiar bleating cry. The *great gray snipe* is common to the western regions of Europe. It is somewhat larger than the common snipe of America. The *red-breasted snipe* frequents the shores both of America and Europe. The latter is about 10 in. long with a wing-spread of 18 in. The *jacksnipe* is somewhat smaller and is indigenous to Europe and Asia. Snipes common to America move far into Canada in the spring, where they breed, and migrate southward in the fall, usually to the Gulf region.

Sniperscope (*snīp'ẽr-skōp*) and SNOOPERSCOPE (*snōōp'ẽr-skōp*), devices to permit visibility in darkness, the former designed for use on weapons, the latter for observation purposes alone. They were developed during World War II (in 1943) as a means to combat the night infiltration tactics of the Japanese. They enable the user to locate an object in total darkness without divulging his own position.

The equipment consists of an infrared light source and an electronic telescope, both powered by a portable power-pack and battery. The power source of infrared radiation, when heated to incandescence, gives off both visible and invisible rays. A filter is provided to cut out the visible rays. The optical system of the electronic telescope is similar to that of the ordinary telescope, but is supplemented by a special type of phototube to make infrared radiation visible to the user.

The two devices operate in the same way. The filtered light source projects an infrared beam. Objects hit by this beam reflect part of the radiation, and this reflection is picked up by the objective lens of the telescope. The phototube then produces a visible image corresponding to the infrared image, and the visible image is magnified by the eyepiece lens of the telescope. All objects thus viewed appear as various shades of green. These two devices were highly successful and were considered particularly important in the campaign on Okinawa. See *World War II.*

Snohomish (*snō-hō'mĭsh*), a city in Snohomish County, Washington, 38 m. from Seattle, at the confluence of the Snohomish and Pilchuck Rivers. It is served by the Great Northern and the Northern Pacific R.R.'s, and is surrounded by a fertile agricultural and mining region. Grain growing, dairying, and lumbering are important industries. It has frozen food, food processing, and meat packing plants. It is the site of a Bonneville Dan Power substation and the terminus of Grand Coulee Dam transmission lines. Snohomish, laid out in 1871, was formerly the county seat, and was incorporated as a city in 1890. Population, 1940, 2,794; in 1950, 3,094.

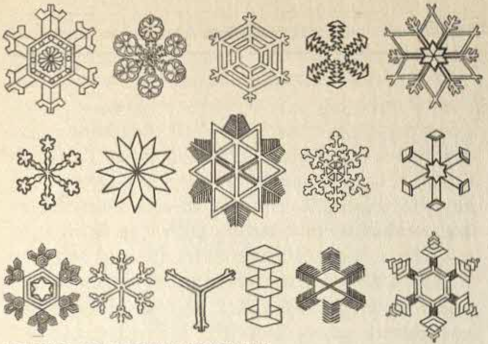
Snorri Sturluson (*snŏr'rĭ stûr'lû-sŏn*), historian, born in Iceland in 1179; died Sept. 22, 1241. At an early age, he began to write epic poetry, using as his subjects contemporary kings and nobles. In 1206, he went to live in Reykjaholt and, after marrying a woman of wealth, became a prominent lawyer and statesman. He served as president of the legislative assembly and supreme court of Iceland from 1215 to 1218 and from 1222 to 1232.

During a visit to young King Haakon and his adviser, Earl Skuli, of Norway, in 1218, Snorri became a vassal of the king. When hostilities arose between Iceland and Norway because of disputes among the merchants, Snorri, who had risen to great power in Iceland, promised to negotiate a peace in Haakon's favor. Haakon, however, becoming suspicious of Snorri's ambition and cunning opportunism, incited a quarrel between Snorri and his kinsman Sturla. In 1236, Snorri fled to Norway to join Skuli, who was plotting an intrigue against Haakon. But in the meantime, Sturla was killed in combat with Snorri's son-in-law Gissur, and Snorri returned to Iceland. Haakon conquered Skuli's party in 1240 and sent orders to Gissur to capture or slay Snorri. Gissur chose to put Snorri to death.

Snorri is one of the greatest figures in classical Scandinavian literature. He composed the Prose, or Younger, Edda and also wrote the "Heimskringla," or Sagas of the Norwegian kings. In separate form he elaborated the great Saga of St. Olaf, patron saint of Norway.

Snow (*snō*), particles of frozen moisture which result when the air is condensed to a temperature below 32° F. An assemblage of such crystals is called a *snowflake*. *Hail* (*q.v.*) and *sleet* are caused by raindrops that freeze in their passage through the air, but snowflakes are formed when the vapor crystallizes, and they are enlarged in size in falling by condensing additional moisture from the air. In mild weather they are larger than when it is extremely cold. They assume a large variety of beautiful forms, so far as known, always essentially hexagonal; fully a thousand have been classified by observers. Snow crystals are viewed to the best advantage under the microscope when they are allowed to fall on a black surface. The finest forms occur only in the polar regions. The star shape is the most common form. Some appear as hexagonal plates and others as hexagonal prisms, and they are often terminated by plates or a group of needles. A number of the forms of snowflakes seen after a light fall of snow is shown in the accompanying illustration.

The incident rays of light are refracted and



FORMS OF SNOW CRYSTALS

reflected by the irregular crystal clusters and operate to give to the eye the colorless sensation of white, but when pressure is applied to bring the crystals into close contact, snow assumes the form and appearance of ice. If the temperature of the air near the surface is warmer than 32° F., any snow that is formed in the upper regions melts before reaching the ground. It is in this way that the absence of snow in the tropics is accounted for; there it falls only near the summits of lofty mountains. Snow melts slowly in the polar zones, thus accounting for the large accumulations in the high latitudes, but the fall is heaviest in the cool temperate regions. Snow seldom occurs south of 36° N. latitude, except in regions modified by high altitudes.

The *snow line* is the lower limit of the region of perpetual snow, above which the ground is covered with snow throughout the year, while below the line it melts in the warm season. The altitude of the snow line depends upon latitude. In the Himalayas, lat. 31° N., it is 17,000 ft.; in the Rocky Mts., lat. 43° N., 12,465 ft.; in the Andes of Ecuador, lat. 1° S., 15,800 ft.; in Norway, lat. 70° N., 3,400 ft.; and in the Andes of South America, lat. 54° S., 3,700. As a rule, that slope of a range which is exposed to the prevalent wind has a lower snow line than the opposite side. In the polar regions the snow line gradually nears the level of the sea.

Snow is an important factor in the economy of nature. It is a nonconductor of heat. Where it falls in abundance it forms a protection to the ground and thereby prevents the temperature from lowering to an extent that would injure seeds and plants. The winds are generally modified by coming in contact with regions covered with snow, while the snow melting on mountains supplies an abundance of water for irrigating arid lands and serves to replenish the rivers by its gradual conversion into water in the warm season. Glaciers are immense masses of ice and snow. They are formed by large accumulations in the snow fields situated above the snow line. *Red snow* was first mentioned by Aristotle, who reported deposits of it on elevated mountain summits. It is most abundant in the Arctic regions and is due to the prevalence of minute organisms of vegetable growth.

Yellow snow derives its color from the presence in the snowflakes of pine or cypress pollen. The fairly common *brown snow* results from the intermixing of dust particles with the crystals of snow.

Artificial snow, first produced in 1946 by the General Electric Co., can be induced by dropping pellets of dry ice into normal clouds. The dry ice causes the cloud to become super-cooled and thereby to precipitate snow.

Snowberry (*snō′bĕr′ĭ*), the common name of a bushy shrub of the honeysuckle family. It is cultivated extensively in America as an ornamental plant. The leaves are simple and the flowers are small. It bears a leafy cluster of snow-white berries at the ends of the branches. The *West Indian snowberry* is a plant of the madder family and is cultivated in greenhouses for its white berries.

Snowbird (*snō′bẽrd*), a genus of birds of the finch family, native to North America, and commonly seen in flocks during the winter. It ranges from Mexico to the northern regions of Canada, is about 6 in. long, and has a slaty-gray color above with white beneath. The snowbird is often seen near houses and barns in the winter time, and in cold weather seeks shelter in haystacks and corn shocks. Snowbirds usually congregate in small flocks, and visit the barnyards in search of food. They subsist on seeds and berries. Their flesh is eaten.

Snow Bunting (*snō bŭnt′ĭng*), a bird of the bunting family, widely distributed in America and Europe. It differs from the true buntings in having a long and nearly straight claw on the hind toe, and it is similar to the lark in its habits of running along the ground. In the summer time large numbers are seen far north in the Arctic region, but they move to temperate climates in autumn.

Snowden (*snō′dẹn*), PHILIP, FIRST VISCOUNT OF ICKORNSHAW, public official, born at Knieghley, Yorkshire, England, July 18, 1864; died in 1937. In 1903 he became chairman of an independent labor party, serving until 1906, when he was elected a member of the House of Commons. J. Ramsay MacDonald made him secretary of the exchequer in 1924 and again in 1929, and in the latter year he represented Great Britain at The Hague conference to settle the distribution of German reparation payments.

He was created viscount in 1931 and remained in the cabinet as lord privy seal until September 1932. Among his writings are "Socialism and Syndicalism," "Labour and Finance," and "If Labour Rules."

Snowdrop (*snō′drŏp*), a genus of early-blooming bulbous plants of the *amaryllis* family.

Several species are cultivated for ornament. The bulbous root produces only a few leaves and a single-flowered, leafless stem. The snowdrop is native to Europe but has been widely naturalized and is grown extensively in gardens. The name *snowdrop tree* is applied to various flowering trees occurring in the southeastern U.S. and in tropical climates.

Snow Leopard (*snō lĕp'ĕrd*). See *Ounce.*

Snowplow (*snō'plou*), a mechanical device of heavy steel plates and structural braces attached to trucks, tractors, or locomotives for cutting, throwing, or rolling to one or both sides of the vehicle fallen snow, for the purpose of keeping roads and tracks open to traffic.

For clearing railroad tracks snowplows are frequently attached to engines pulling ordinary trains or pushed forward by a single engine. Most snowplows are so constructed that the cutting blades throw the snow toward both sides of the track. Another class, the rotary plow, has buckets which scoop up the snow and convey it to a hopper, whence it is blown to one side by a fan.

For clearing streets and sidewalks, there are four other types of snowplow, almost all Diesel powered. There are small plows for clearing crosswalks and intersections, one-way plows for the clearing of light or medium accumulations of snow, reversible plows for moving snow to either side without turning the vehicle, and V-type plows for moving snow to both sides of the vehicle in cases of heavy plowing. Most plows have a curved mold board to roll snow, thus eliminating the strain of heavy pushing.

Snowshoe (*snō'shōō*), a device made of sinew, rawhide, wood, or some other light material, and fastened to the bottom of the foot to support the wearer in walking over snow. Those made of sinew or rawhide have a light wooden frame, over which the material is stretched, and there is a device in the center for attaching it securely to the shoe. The length varies from 2 to 5 ft. and the width from 1 to 2 ft., as a large surface must be provided to prevent sinking into loose snow. Shoes of this kind are worn extensively by Eskimos, Sioux Indians, and Caucasians in regions far north. The *ski* is a variant type of snowshoe, or skate, which is used extensively in Scandinavian countries and elsewhere, both for transport and for sport. See also *Skates; Ski.*

Snuff (*snŭf*). See *Tobacco.*

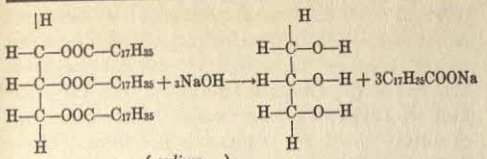
Snyder (*snī'dĕr*), JOHN WESLEY, banker and cabinet member, born June 21, 1896, in Jonesboro, Ark. Educated at Vanderbilt Univ., from 1919-30 he served with various banks in Arkansas and Missouri, becoming, in the latter year, national bank receiver in the Office of the Comptroller of the Currency in Washington, D.C. He left that office in 1936, becoming manager of the St. Louis Loan Agency of the Reconstruction Finance Corp. (1937), and, in 1940, executive vice president and director of the Defense Plant Corp., an RFC subsidiary. He returned to private banking in 1943, but after Harry S. Truman became President he was recalled to government service in April 1945, as Federal Loan Administrator. He had held this position only three months when Truman named him Director of the Office of War Mobilization and Reconversion, with the task of overseeing the economic reconversion of the U.S. from a wartime to a peacetime basis. In June 1946, Snyder became Secretary of the Treasury.

Snyders (*snī'dĕrs*), FRANS, painter, born at Antwerp, Belgium, in 1579; died in 1657. He was descended from Flemish parents, studied under Pieter Breughel and was a friend of Rubens. He visited Italy to study art and there did copies of Italian masters for Jan Breughel. He returned to his native country in 1609, when he took up his residence in Antwerp. Especially interested and talented in depicting hunting scenes, he caught the movements and colors of animals magnificently. He worked with Peter Paul Rubens, doing the animals in Rubens' paintings, while Rubens sometimes painted the human figures for Synders' canvases. Snyders also did portrait and genre painting and his works are preserved in many of the great museums and collections of Europe. His finest works include "Cock Fight," "Stag Hunt," "Lions Pursuing Deer," and "Earthly Paradise."

Soane (*sōn*), SIR JOHN, English architect, born Sept. 10, 1753; died Jan. 20, 1837. He was appointed architect to the Bank of England in 1788, thereafter devoting all his energies to work on public buildings. He was knighted in 1831.

Soap (*sōp*), a salt of a fatty acid and a metal. The fatty acid and metal usually used are stearic acid and sodium respectively. Soap owes its importance to its detergent (cleaning), antiseptic, and lubricating properties.

Soap may be prepared in two ways: by the reaction of the hydroxide of an alkali metal with a fat or oil, or by the reaction of the hydroxide directly with the fatty acid of the soap to be prepared. In the former method, warm caustic solution is thoroughly mixed with a glyceride such as tallow, lard, grease, or oil and heated for several hours. The reaction produces glycerin and a solution of soap. Some of the latter comes to the top of the reaction mixture and may be separated mechanically, while the part remaining in water is precipitated, or "salted out," by the addition of sodium chloride. The glycerin is likewise largely removed by this method. The precipitated soap is washed to remove salt and glycerin. The chemical equation describing the reaction is:



Fat plus {*sodium hydroxide*} equals *glycerin* plus *soap*

There are many varieties of soaps in common use, employed for different purposes. Generally a mixture of sodium salts of several fatty acids is obtained on treating a fat or oil with sodium hydroxide. Various ingredients are mixed with these salts to produce a soap of desired properties. Laundry soap is chiefly sodium stearate (sodium salt of stearic acid) with as much as 30 per cent sodium silicate or 5 per cent trisodium phosphate with large amounts of rosin. Toilet soap contains about 70 per cent fatty and resin acids, and shaving soap also contains fatty acids, oil, and some gum to produce a persistent lather. *Hard* (less soluble) soaps are made with sodium hydroxide, while *soft* (or more readily soluble) soaps are made with potassium hydroxide. Salt-water or marine soap (made from coconut oil) contains salts of caproic, caprylic, capric, and myristic acids which are very soluble. These salts are unaffected by the magnesium (Mg^{++}) and calcium (Ca^{++}) ions in sea water which readily form a precipitate with ordinary soap and prevent its lathering. *Castile* soap is made from sodium carbonate and olive oil, and green soap from linseed oil and potassium hydroxide.

Soap is used with water to remove greases and oils. The soap ion ($C_{17}H_{35}COO-$) has a dual nature. The hydrocarbon part ($C_{17}H_{35}-$) is a long chain and dissolves readily in the grease while the charged part ($COO-$) is insoluble in the grease and remains in the water. Thus the soap ion serves as a link between the water and the grease and causes the latter to become dispersed as small spherical droplets in the water, leaving a clean surface.

Salts of heavy metals (copper, zinc, iron, lead) are used for waterproofing leather.

Soap Carving (*sōp′ kärv′ing*). See *Carving.*

Soapstone (*sōp′stōn*) or STEATITE, a solid grayish-green variety of talc (*q.v.*), composed chiefly of impure hydrated silicates of magnesia. The name refers to the soapy feeling it presents to the touch when it is wet. Soapstone is durable and takes a high polish, making it useful in the carving of art objects. Various types have been used in the manufacture of sinks, laboratory tables, and stoves, as well as for building purposes. A variety called *freestone* was formerly used, heated, as a foot warmer. Deposits of soapstone are found in New England and in the Lake Superior region.

Sobieski (*sō-byĕs′kē*), or JOHN III, King of Poland. See *John III.*

Sobrayne (*sō-brän′yĕ*), the name of the Bulgarian legislature or parliament.

Soccer (*sŏk′ĕr*). See *Football,* ASSOCIATION.

Social Democrats (*sō′shạl dĕm′ō-krăts*), a political faction in many countries which favors Socialist principles in government.

Socialism (*sō′shạl-ĭz′m*), the term applied to various theories of social organization which aim to reorganize society on the basis of cooperation rather than competition. It is applied in a loose sense to all schemes for abolishing social inequality. When employed in this aspect it is generally designated as Utopian Socialism, which strives to build up an ideal state of society founded on principles of justice. Socialist ideals, antedating the capitalist order, can be found in the theories of Plato (*ca.* 427-347 B.C.), in the expressed concepts of various religious sects, and in Sir Thomas More's "Utopia" (1516), in which is described his idea of the perfect economic order.

Scientific socialism is a term applied to the economic theories of Karl Marx (1818-83). It maintains that the material from which labor produces wealth, that is, land, should be the property of the community rather than of individuals. Socialism in the last century has won many more followers than were previously attracted to it. The spread of socialist doctrines has been so rapid within the last 100 years that many writers speak of it as a new theory of government.

Socialism as a political force seeks to stimulate the gradual adoption of certain reforms, such as government ownership of a country's natural resources, government control of production and distribution to serve the interests of the masses rather than of the individual, recognition of man's right to steady employment, and old-age and health insurance in the economic field; international cooperation in politics; free and compulsory education and public support of the arts and sciences in the cultural field. Its advocates argue that socialism is the highest state of political evolution in society, and that by a process of natural development it will ultimately secure recognition as a fundamental principle in government. In support of this theory they cite the fact that *slavery* was once a widespread institution, but gave way to feudalism, while *feudalism* was succeeded by capitalism, and *capitalism* will necessarily be replaced by socialism.

Modern writers have produced an extensive literature on the subject, which has long influenced thought among the laboring and industrial classes all over the world. The earliest influential socialist of England was Robert Owen (1771-1858), who founded an unsuccessful community at New Harmony, Ind., in this country. Frenchmen such as Jean Jacques Rousseau (1712-

78), Claude Henri, Count de Saint-Simon (1760-1825), François Noel Babeuf (1760-97), and Pierre Joseph Proudhon (1809-65) did much toward formulating modern Socialism which found its most eminent writers and advocates in Germany. It grew under the leadership of Karl Marx and Friedrich Engels. The first significant event was the publication by Marx and Engels of the "Communist Manifesto" (1848). Here, and in Marx's principal work, "Capital," published in 1867, are set forth the Socialist principles which profoundly affected the 19th and 20th centuries. Based somewhat on Hegelianism, they maintain that labor is the source of all wealth, that the accumulation of wealth in private hands must be ended, and that ownership of property must lose its class basis. Marx and Engels founded the First International (*q.v.*) and laid the foundation of the Socialist parties which gained varying influence in national politics in a number of countries. Although these parties adapted their concepts to suit particular circumstances, the fundamental principle was Marxism. From the beginning, advocacy of evolutionary measures has prevailed in contrast to the methods proposed in Communism.

Through the decades Socialism has appeared in many varied manifestations. Among the most important Socialist movements or modifications are the Fabian Society in England (a moderate group advocating state Socialism, organized by Thomas Davidson in 1884 and championed by such men as George Bernard Shaw and Sidney Webb) and syndicalism (*q.v.*) in France and Spain. Socialism has enjoyed considerable strength in the Scandinavian countries. The alleged state Socialism of the National Socialist party in Germany and of the "corporative state" of Italy were really perversions and had no real root in genuine Socialism. State Socialism takes its text from the theories of the German Karl Rodbertus (1805-75). Adherents to this concept desire the achievement of collectivism by the state without abolishing private property.

Socialism has never attained an influential status in the U.S., partly because this country, despite its intense industrialization, is still essentially rural in character. Of at least equal importance is the fact that economic conditions have not favored the growth of a distinct laboring class to which Socialism would appeal. The living standard of the great mass of workers in the U.S. has consistently, since the late 18th century, been on a relatively high level. Socialism in this country dates back to the groups inspired by German democratic refugees who founded the Social Democratic Workingmen's party in 1874. These tendencies have, however, largely found their outlet in the labor unions. Socialist leaders in this country have been Eugene Debs (1855-1926), Morris Hillquit (1869-1933), and Norman Thomas (1884-).

Although *Christian Socialism* opposed the so-called class struggle of the Socialist movement, in the late 19th century the Christian church made an attempt to reconcile Socialist doctrines with Christian teachings, contending that Christ preached a society based on brotherhood and the betterment of conditions of life in this world. Modern Christian Socialism included among its advocates Charles Kingsley (1819-75) in England, Johann Heinrich Wichern (1808-81) and Adolf Stoecker (1835-1909) in Germany, and John Humphrey Noyes (1811-86) of the Oneida Community in the U.S. Following World War II political parties whose basic principles were those of Christian Socialism gained considerable strength in Europe, notably in Italy and France.

SOCIALISM VS. COMMUNISM. The term Socialism has many definitions. There is no one doctrine, nor is there an integrated international Socialist movement analogous to the Communist movement. Generally speaking, Socialists call for the abolition of capitalism and imperialism and demand a planned economy based on the public ownership and control of the means of producing and distributing goods. In this sense the Communists are Socialists; in fact, they claim that a Socialist society exists in Russia and that the establishment of Socialism elsewhere is their goal. The Communists hold that the end justifies the use of any means and in the name of the working class demand a dictatorship which they describe as "true democracy." Non-Communist Socialists reject these principles; they agree with the Communists in general as to the nature of the ideal economy, but regard the preservation of ethical, humanitarian, and democratic values as essential aspects of their cause. They hold that the Communists seek Socialism through an authoritarian party subservient to Moscow. For these and other reasons the non-Communist Socialists repudiate Communist Socialism. See also *Communism; International; Labor; Labor Legislation; Political Economy; Political Parties; Trade Unions.*

Social Legislation (*sō′shạl lĕj-ĭs-lā′shŭn*). See *Fair Labor Standards Act; National Labor Relations Act; National War Labor Board; Social Security; United States; Workmen's Compensation.*

Social Philosophy (*sō′shạl fĭl-ŏs′ō-fy̆*), that branch of philosophy which deals with the theoretical examination of social problems; sociology proper is a scientific study of social phenomena.

Social Psychology (*sō′shạl sī-k̤ŏl′ō-jy̆*), that branch of psychology which is especially concerned with the effect of social influences on personality development and with the interrelationships between individuals and between groups. See *Psychology; Sociology.*

Social Sciences (*sō′shạl sī′ẹn-sẹz*), the sciences that deal with the various aspects of human society. See *Anthropology; Geography; History; Political Economy; Psychology; Sociology.*

Social Security (*sō'shal sē-kū'ri-tў*), the protection, through government action, of working men and women and their dependents against hazards that may diminish or eliminate their income: unemployment, old age, sickness, or death of the breadwinner.

In the U.S., public efforts to promote social security go back to the country's early days, when relief of the poor was carried on by local communities. The states gradually assumed part of the responsibility for public welfare programs. The social security programs on a nationwide basis date from August 1935, when the Social Security Act was passed.

The act set up a system of Federal old-age insurance and provided for Federal cooperation with the states in the administering and financing of their unemployment insurance laws and their programs for aiding three groups of the needy—dependent children, the aged, and the blind. The act also made Federal funds available to the states for health and welfare services for children and their mothers. The old-age insurance program was expanded in 1939 to permit payment of survivor and dependents' benefits. Significant amendments to the Social Security Act were made after 1946. In 1950 a new category of public assistance was added—aid to the permanently and totally disabled—and in 1956 the Federal old-age and survivors insurance program was broadened to include disability insurance benefits.

On July 1, 1939, administration of many social programs were brought together in the Federal Security Agency. On April 11, 1953, the agency was abolished and its powers and functions established in a new cabinet department—the Dept. of Health, Education, and Welfare. The Social Security Admin.—a constituent of the department—has responsibility for three major social security programs: Federal old-age, survivors, and disability insurance; the Federal aspects of public assistance; and the Federal aspects of maternal and child health and child welfare services. It also administers operations under the Federal Credit Union Act. The Federal-state program of unemployment insurance and employment service is under the direction of the Dept. of Labor.

OLD-AGE, SURVIVORS, AND DISABILITY INSURANCE: This program is operated by the Federal government. It provides monthly insurance benefits for workers and their families when the worker is old and stops working or in case of his death; it also pays monthly benefits to the worker if he has a long and disabling illness between the ages of 50 and 65. The benefit amount is related to the worker's average monthly earnings in employment covered by the Social Security Act and is weighted in favor of low-paid workers.

Monthly retirement payments are made to the qualified worker himself after he reaches age 65 and stops regular work (a woman worker may elect to stop work at 62 and receive a reduced benefit); his wife also receives a benefit if she is 65 or has an entitled child in her care (under the 1956 amendments the wife with no entitled child may decide to receive a reduced benefit at 62); his children will also receive benefits until they reach age 18.

Monthly survivor payments are made after the death of a qualified worker to his children until they reach age 18 (or after that age to a totally disabled child); to his widow while she has such children in her care or when she reaches age 62 (or to a former wife divorced who has an entitled child in her care); or, if he has left no widow or young child, to his dependent parents (at age 62 for mothers, age 65 for fathers). Benefits based on the wage record of a woman worker may be paid at age 65 to a dependent aged husband or widower and to surviving children whether or not the father contributes to their support.

A lump-sum payment is made at the death of every insured worker.

Monthly disability benefits, computed at the same rate as the retirement benefits, are made to qualified workers between the ages of 50 and 65. To qualify for the disability benefit, the worker must have a disability that has lasted for six months or more; it must be considered likely to continue indefinitely and prevent him from doing any substantial gainful work; and he must be fully and currently insured under the program.

Workers under the age of 50 who have a long disabling illness may have their earnings record frozen so that periods with little or no earnings will not adversely affect the amount of any benefits later payable to them.

The minimum old-age benefit at age 65 is $30.00; the maximum retirement payment is $108.50. The maximum family payment cannot be higher than 80 per cent of the worker's average monthly wage or $200, whichever is less. A beneficiary may earn as much as $1,200 a year and still receive full benefits, and after he is 72 he will receive benefits regardless of earnings.

The 1935 law covered workers in commerce and industry (except railroad workers for whom a separate system was established); amendments expanded coverage to include self-employment, the Federal uniformed services, and most employment previously not covered. Groups still excluded are self-employed doctors of medicine; most Federal civilian employees under retirement systems; in general, policemen and firemen covered by a state or local retirement system; low-income self-employed persons; and farm and domestic workers not regularly employed. To qualify for monthly payments when he retires or becomes disabled or to make payment of survivor benefits possible for his survivors, a worker must have been in covered employment for a certain length of time. At the beginning of 1957, about 73,300,000 workers had acquired insured status. In May 1957 monthly old-age and survivors insurance benefits were paid to 10,175,700 persons. Monthly disability benefits were first payable for July 1957.

Contribution rates, which had been 2 per cent each for employers and employees in 1956, were raised ¼ of 1 per cent each at the beginning of 1957 to finance the new disability benefits. The self-employed, who pay 1½ times the rate for the employee, were contributing at a rate of 2⅜ per cent in 1957.

Public Assistance: Under the Social Security Act, state-initiated and state-administered plans of assistance for the needy aged, for dependent children, for the needy blind, and for the needy permanently and totally disabled may receive Federal financial aid. Each state determines the qualifications for aid and the amount of aid to be given but must meet certain general standards. For Puerto Rico and the Virgin Islands, there is a dollar limitation on the total annual Federal payments. All the states, Alaska, the District of Columbia, Hawaii, Puerto Rico, and the Virgin Islands make monthly payments to the needy aged, dependent children, and the blind; in 46 of these jurisdictions, payments were also being made in 1957 to needy permanently and totally disabled persons.

The 1956 amendments also provide for dollar-for-dollar Federal sharing in expenditures for payments to suppliers of medical care for assistance recipients, over and above Federal matching in money payments. In the programs for the aged, the blind, and the disabled, as well as in the aid to dependent children, the Federal government participates, effective July 1957, in such expenditures up to a certain maximum amount. The states, however, have the option of operating under the 1956 provision or as they had been before that date.

In May 1957, 2,506,400 persons were receiving old-age assistance, at an average payment of $58.56 a month. Payments under aid to dependent children were going to 1,826,700 children in 646,200 families, at an average payment of $96.67 per family. Payments to the needy blind averaged $63.82 and went to 108,142 blind persons. Under aid to the permanently and totally disabled, 281,865 persons were receiving payments averaging $59.24. Under general assistance, which is administered without Federal sharing in the costs, some 736,000 persons were aided, at an average payment of $56.15.

Maternal and Child Health and Child Welfare Services: Under the Social Security Act, the Federal government makes grants to the states to help them extend and improve their programs for health services to mothers and children, for child welfare services, and for crippled children. The U.S. Children's Bureau has responsibility for the administration of these grants, which went in 1956 to all the states, the District of Columbia, Alaska, Hawaii, Puerto Rico, and the Virgin Islands (except that one state received no grants for crippled children's services).

Maternal and child health services are primarily preventive in nature and chiefly provide prenatal clinics, child health conferences for children of preschool age, home nursing visits, medical and dental services for school-age children, and nutritional and mental health programs. Federal payments to the states for these services currently amount to $16,500,000 annually.

In the program for crippled children, for which an annual amount of $10,000,000 is authorized, states provide a wide range of services for children suffering from a crippling condition or a condition that may lead to crippling.

The authorization in the act for Federal grants to the states for child welfare services was raised to $12,000,000 in 1956. The primary aim of these services is to enable dependent and neglected children and children in danger of becoming delinquent to receive the care they need in their own homes; services also help protect and care for homeless children.

Employment Security: This program is designed to bring workers and jobs together and to pay out-of-work benefits to insured workers when they are laid off. Every state has a public employment office with administrative costs paid through Federal grants; these offices are allied with the state unemployment insurance offices which also take care of claims for out-of-work benefits. The amount of the benefit depends on the worker's average pay and the length of time he has worked. It is intended to replace about half the weekly pay in most states, up to a maximum that varies from $24 to $45 a week; it is paid, in most states, for as long as 26 weeks. Some states pay additional allowances for dependents. To pay for the benefits, the state collects contributions from the employer on a certain percentage of his payroll. The money is deposited in the U.S. Treasury. At the end of March 1957, total funds available for benefits amounted to $8,375,647,000.

Other U.S. Programs: In addition to these programs, all states have programs of workmen's compensation (*q.v.*), covering industrial accidents and diseases; there is also Federal workmen's compensation covering certain groups. Railroad workers and civilian employees of the Federal government have unemployment, retirement, long-term disability, and survivor protection; railroad workers have temporary disability protection as well. Employees of many state and local governments have special retirement systems, in many cases supplementing coverage under Federal old-age, survivors, and disability insurance; in some states, these systems also provide disability and survivor protection. Temporary disability insurance programs for workers in commerce and industry are in operation in four states.

Private employee benefit plans supplement the Federal old-age, survivors, and disability program for an increasing number of workers. The first industrial pension plan was set up by the American Express Co. in 1875. Growth in such plans has been especially rapid since 1945, spurred by such factors as wartime wage controls, the development of collective bargaining, and favorable tax treatment. In 1954 it was estimated that more than 31,000,000 workers covered by employee benefit plans, providing a variety of benefits. From 1954 through 1957, Congress studied the operations of employee health and welfare and pension plans and in mid-1957 had under consideration legislation to protect the interests of the employees covered. Several states also conducted studies of these plans and some enacted laws designed to safeguard the employees' rights.

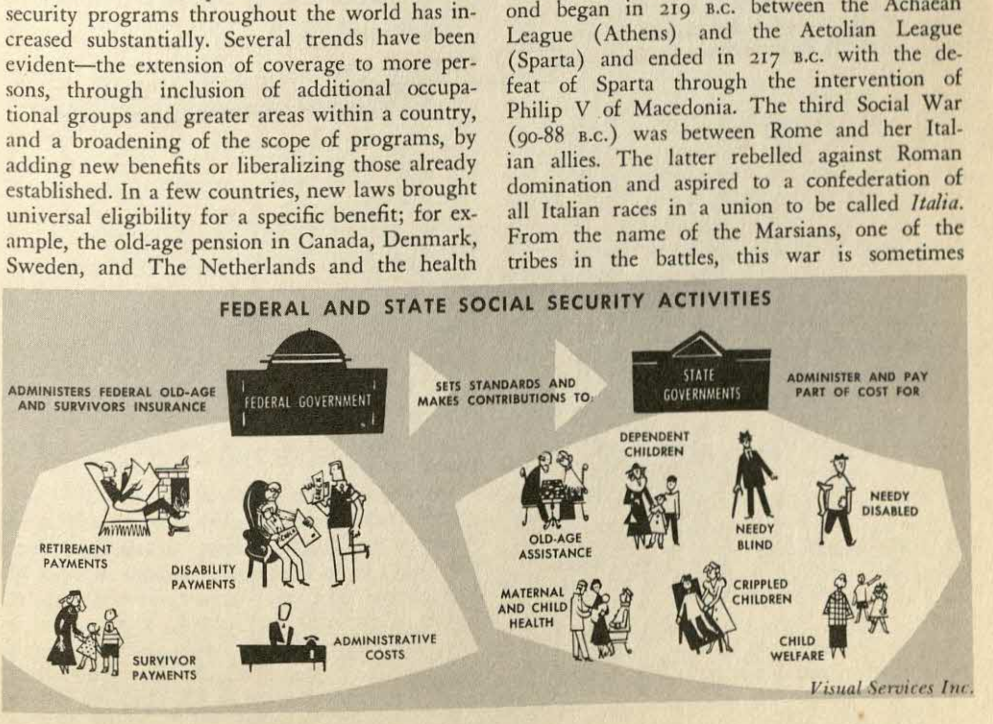
Recent World Developments: Since 1935, when the Social Security Act was adopted in the U.S., the number of persons covered under social security programs throughout the world has increased substantially. Several trends have been evident—the extension of coverage to more persons, through inclusion of additional occupational groups and greater areas within a country, and a broadening of the scope of programs, by adding new benefits or liberalizing those already established. In a few countries, new laws brought universal eligibility for a specific benefit; for example, the old-age pension in Canada, Denmark, Sweden, and The Netherlands and the health services in Great Britain. Legislation in some countries has taken into account the rise in living costs and wages. As of March 1957, 51 countries had old-age, invalidity, and survivors insurance (or pension) programs, 74 provided workmen's compensation, 20 had unemployment insurance programs, and 34 provided family allowances.

See also *Pension; Veterans Administration.*

Social Settlement (*sō′shạl sĕt′'l-mẹnt*), a center, usually located in a crowded area of a large city, which is set up to help the residents of the area to achieve better individual or community life or to combat antisocial conditions. In addition to their functions as centers for social work (*q.v.*), the settlements organize classes in arts and handicrafts, recreational activities, and libraries, and serve as meeting places for clubs and discussion groups, etc. They have offered baths and banking facilities, as well as gymnasiums. Settlements are particularly active in the health field, offering well baby clinics and prenatal care, as well as individual guidance for disturbed persons.

Noted settlements include Toynbee Hall, in London, set up in 1884; the University Settlement, set up in 1887, Greenwich House, and the Henry Street Settlement, all in New York City; and Hull House in Chicago. See *Addams, Jane; Wald, Lillian.*

Social Wars (*sō′shạl wạrz*), the name applied to three wars of ancient history. The first (357-355 B.C.), was fought between Athens and a confederation of Greek islands. The second began in 219 B.C. between the Achaean League (Athens) and the Aetolian League (Sparta) and ended in 217 B.C. with the defeat of Sparta through the intervention of Philip V of Macedonia. The third Social War (90-88 B.C.) was between Rome and her Italian allies. The latter rebelled against Roman domination and aspired to a confederation of all Italian races in a union to be called *Italia.* From the name of the Marsians, one of the tribes in the battles, this war is sometimes



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called the Marsian or Marsic War. The outcome of the fighting was the enfranchisement of all loyal allies of Rome and all others who would return to allegiance in return for cessation of revolt.

Social Work (*sō′shạl wûrk̦*). The term *social work̦* came into general use only in the 20th century, and is a modern development of earlier efforts to alleviate conditions adversely affecting the well-being of individuals, families, and communities. Social work includes the prevention and relief of poverty, the protection and care of children, the prevention and treatment of delinquency, the general abolition of conditions inimical to social welfare, and the positive support of forces encouraging it.

Poor relief, an early form of social work, grew out of the recognition that governments (first local, then state and Federal) were responsible for the well-being of their citizens. Early concern was felt for the child as such, and children were among the first persons for whom special provision, apart from that for the sick, insane, aged, and others, was made.

Humanitarianism, sweeping Europe between the end of the French Revolution and World War I, must take credit for the anti-slavery movement, factory legislation, the abolition of capital punishment, the Red Cross, prison reform, and the better treatment of the insane. Equalitarianism, arising from the French and American revolutions, was another great factor in the growth of social work. The Industrial Revolution which gave rise to and exploited groups of workers gave impetus to the enactment of social legislation and the founding of humanitarian societies in mid-19th century. Charity organization societies and social settlements first established about the same time were the seedbeds of modern social work.

Social case work was initiated in England by Thomas Chalmers (1780-1847), who introduced the method of investigation as a means of aiding needy persons. Scientific thinking in social case work has made use of specific contributions from sociology, economics, biology, political science, and, most recently, the psychiatric interpretation of personality. The social study (formerly called investigation) is the basis of modern social case work and comprises information about the client and received largely from him. The professionalization of social work is probably its most distinctive modern characteristic; practically all case work is now carried on by agencies employing trained personnel. The principal types of case work are family, child, medical, and psychiatric. Probation and parole, at their best, are also case-work services.

Present-day social work emphasizes the interrelationship between faulty environment and personal character as a cause of social maladjustment. In the U.S. and Great Britain, it works largely within the framework of existing social institutions. However, social work also attempts gradually to change conditions inimical to social welfare and strongly resists becoming merely the instrument of the state, as recently happened in the totalitarian nations. American social agencies have provided pre-natal and post-natal care; work in tuberculosis and malnutrition; the positive pursuit of social hygiene and sex education; urban and rural recreational programs; relief and assistance to persons in need. Accomplishments include surveys and community appraisals; social security measures for children, for aged persons, blind persons, and unemployed workers; vast work programs for the employment of unemployed workers who would otherwise lack the means of subsistence. Social work is technically divided into social case work, group work, community organization, and administration.

Training for social work is provided in graduate schools, of which, in 1946, there were 47 in the U.S., Canada, and Hawaii. The American Assn. of Social Workers, a professional organization concerned with the improvement of social-work services and techniques, was founded in 1921. By 1946, it had 11,000 members. The total number of social workers reported by the U.S. census of 1940 was 70,000. According to a reliable estimate, however, the number of positions in the U.S. requiring professional social work skill increased to approximately 125,000 after World War II.

While public taxation has long supported social work and now finances all but a small fraction of the cost of relief, there are in the U.S. many types of privately financed social-work agencies. In part, these are supported through voluntary contributions, the bulk of which are raised annually through local "community chests" (*q.v.*). Further sources of funds for social welfare work are the privately endowed foundations devoted in whole or part to social work. The Rockefeller and Carnegie Corps., with capital assets totaling $200,000,000, are the most famous, but others include the Commonwealth Fund, the Milbank Memorial Fund, and the Twentieth Century Fund. In 1946 a special report of the Russell Sage Foundation enumerated 163 foundations devoted to education, 150 to social welfare, and 129 to health services.

Society Islands (*sō-sī′ę-tў ī′lạndz*), an island group in the South Pacific, lying directly E. of Australia and S. of the Hawaiian Islands. It consists of 13 main islands and a large number of smaller ones. The group has an area of 650 sq. m. Tahiti is the principal island. The surface is generally elevated, with mountains of considerable height. A ridge of highlands extends across Tahiti, which terminates in Mt. Orohena, height

Courtesy French Press & Information Bureau, N. Y.

SOCIETY ISLANDS

View of Tahiti, the principal island in the group

7,339 ft. Other summits reach elevations ranging from 3,500 to 6,980 ft. The climate is mild and healthful, and the soil is generally fertile. Among the chief items grown are cotton, coffee, sugar, guavas, lemons, oranges, and other tropical products. The shell fisheries are of considerable value, and there are deposits of minerals, such as clay, iron, and granite. Horses, swine, cattle, sheep, and poultry are raised. The chief industries are copra and phosphate.

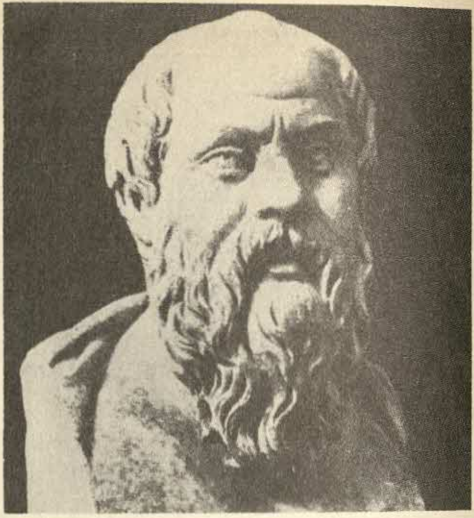
Tahiti was discovered by the Portuguese in 1607 and explored by Capt. Samuel Wallis, of England, in 1767 and by Louis Antoine de Bougainville, of France, in 1768. in 1769 Capt. James Cook arrived and named the group the Society Islands after his sponsor, the Royal Society of London. Due to conflicts between Protestant and Catholic missions, the queen of Tahiti asked (1842) that Tahiti be placed under French protection. In 1880 the islands became a French colony and, in 1946, a part of the overseas territory French Polynesia, governed by an elected assembly and a resident governor. The islands are represented in the French assembly and in the French Community. Papeete, on Tahiti (pop., 17,247), is the capital and chief port. Population, *ca.* 37,500.

Sociology (*sō-sĭ-ŏl'ô-jȳ*), the scientific study of the phenomena arising out of the group relationships of human beings. It studies and describes the origin, growth, structure, characteristics, and functioning of group life through the operation of cultural, psychological, biological, and geographical factors as these influence one another. Some sociologists give primary attention to human beings in their social relationships, focusing their attention upon the socialized individual in his various roles and functions; others are interested primarily in the characteristics of groups and institutions resulting from specific situations, such as conflict, association, and assimilation among human beings. The study of sociology calls for a variety of tools, including historical records, ethnological studies, case studies, statistical research, and social surveys. In recent years there has been a distinct trend toward increasing reliance on factual studies and attempts to formulate precise statements of the findings. There have been major improvements in the application of quantitative methods and improvements in the qualitative techniques available. Some sociologists have developed experimental and observational techniques involving a combination of statistical procedures and laboratory controls. Some of the major branches of contemporary sociology include social theory, historical sociology, the community, social psychology, rural sociology, urban sociology, the study of institutions, social welfare, criminology, and population.

The word "sociology" was coined by Auguste Comte (1798-1857), who is the earliest of the modern writers on this subject to give it a place of more than ordinary prominence. Comte's work was grounded in a tradition which sought to apply the principles of a developing physics and biology to social phenomena. He defined sociology as a general science of social order (or structure) and social progress (or dynamics), and in his works he describes social physics and social dynamics. He views the evolution of society as having occurred in three stages: military-theological, critical-metaphysical, and scientific-industrial. In contrast to earlier social philosophers, he attempts to base his social philosophy on scientific methodology. Somewhat later, Herbert Spencer (1820-1903) developed his great systematization of concrete data in his "Principles of Sociology." He also applied the concepts of physics and biology and particularly developed a concept of evolution in social phenomena. He viewed society as a super-organism subject to laws and conditions essentially similar to those which apply to ordinary organisms. In the U.S., Lester F. Ward (1841-1913) developed these concepts further, building a system of sociology that was essentially monistic and deterministic. In his "Applied Sociology" he stressed especially the role of education in development of a scientific meliorism. Both in the U.S. and in other countries there has been a rapid development of the field since that time, with a drift away from the attempt to apply physical and biological terms and laws in any rigid manner. There has been a growth of specialization and increasing attention to method. There has also been a growing tendency to view institutional and cultural elements as self-originating and self-perpetuating phenomena rather than to seek explanations in physical or biological terms.

Socrates (*sŏk′rȧ-tēz*), Greek philosopher, born in Athens about 470 B.C.; died there in 399 B.C. In his youth he practiced the art of a sculptor, which he had learned from his father Sophroniscus. He served as a common soldier in several important battles, winning distinction for himself by deeds of unusual bravery. He also played a prominent role in Athenian political life, at one time, in his capacity as presiding judge at a trial of military officers, withstanding public clamor to proceed in illegal fashion against the defendants, and on another occasion resisting at the peril of his life what he regarded as unjust commands of the tyrants in control of Athenian government at that time. But his chief claim to fame is as a critic of the unanalyzed habitual beliefs of his day and as a teacher of philosophy.

Socrates wrote nothing, and our present knowledge of his teachings is derived almost entirely from the accounts given by Xenophon in his "Memorabilia" and especially by Plato in his various "Dialogues." However, scholars have found it difficult if not impossible to separate out in these writings what is specifically Socratic doctrine from the interpretations and additions supplied by their authors. Indeed, if we can take Plato's word for it, Socrates disavowed the possession of any special knowledge or wisdom, and claimed for himself only the merit of recognizing his own ignorance. He described his mission in life as that of a gadfly, rousing from smug torpor the complacent claimers to knowledge they did not possess, and also that of an intellectual midwife, assisting by his questioning the birth of ideas in others. The "Socratic method," which he consistently practiced in his conversations with the young men of Athens, in fact consisted in putting searching questions to his hearers, thereby making the latter aware of the presuppositions underlying their unexamined beliefs, and eliciting from them information which they did not suppose they possessed. He apparently regarded knowledge as a species of reminiscence, maintaining that men are born with knowledge implicit in their souls which the latter had acquired before entering into mortal bodies, so that only the proper sort of questioning was required in order to make that knowledge explicit. This view is certainly not incongruous with the legend that Socrates was subject to mystic experiences and that he enjoyed the warning voice of an inner *daimon* which checked him from wrong actions.



SOCRATES

The primary preoccupation of Socrates was with moral rather than cosmological questions, and he was apparently a decisive influence in turning the direction of Greek thought from the physical speculations in which predecessors had been engaged toward the analysis of ethical issues. Socrates felt the lack of clarity in the fundamental moral beliefs of his contemporaries, and devoted his efforts to compelling his hearers to supply general definitions of the moral concepts they employed (such as piety, courage, and justice). He maintained that moral virtue and knowledge are identical, claiming that anyone who really knew what the good is would not fail to pursue it in preference to other things. Much of his searching questioning was directed against the Sophists and the view they made popular that moral standards are relative and are the outcome of arbitrary human conventions; in opposition to this doctrine Socrates took the position that the nature of what is good for man does not depend on human caprice and cannot be determined in terms of opportunistic principles of conduct.

Socrates incurred the hostility of important political figures in Athens, partly because of his critical questioning of the accepted moral assumptions of his day, and in large part because his teachings were felt to endanger the continuance in power of the democratic party in Athens and to favor the aristocracy. But an indictment was preferred against him, not on these grounds, but on the ground of his alleged impiety toward the gods and of his corruption of the morals of the youth. In spite of the brilliant defense he made in his own behalf, reproduced in Plato's "Apology" (no doubt with many additions), he was condemned to death. He refused the opportunity provided by wealthy friends to escape from prison, on the ground that such an act would be inconsistent with his mission in life. A movingly dramatic account of his last days, and of his conversations with his friends concerning the immortality of the soul, is contained in Plato's "Phaedo."

Soda (*sō'dạ*), chemically, an oxide of sodium, Na_2O, but the term is applied in ordinary language to an impure carbonate of soda, Na_2CO_3, which is used for glass making, washing, and hard soap, and also to sodium bicarbonate, $NaHCO_3$, a common mild alkali used in cooking (also called *baking* soda). Carbonate of soda is manufactured in large amounts by the Solvay ammonia soda process in which carbon dioxide and ammonia are passed into a cold saturated solution of salt. After filtering and heating to convert the sodium acid carbonate into sodium carbonate, the ammonia and part of the carbon dioxide are recovered and re-employed in the process. Soda is a white powder, soluble in water. Large quantities are manufactured for the trade.

Soda Water (*sō'dȧ wät'ẽr*), an effervescent drink, consisting of water strongly charged under pressure with purified carbon dioxide gas. It is so called because the gas with which it is charged was formerly generated from sodium bicarbonate with an acid.

Soddy (*sŏd'ĭ*), FREDERICK, chemist, born in Eastbourne, Sussex, England, Sept. 2, 1877; died in Brighton, Sept. 21, 1956. He was educated at Eastbourne Coll., the University Coll. of Wales, and Merton Coll., Oxford. He spent the years 1900-02 in Canada as demonstrator in chemistry at McGill Univ., Montreal, where he worked with Sir Ernest Rutherford on the atomic disintegration of radioactive elements. Rutherford later won the Nobel Prize for chemistry for his research in this field. Soddy also studied (1903-04) with Sir William Ramsay in London and spent ten years (1904-14) as lecturer in physical chemistry and radioactivity at the Univ. of Glasgow. He was professor of chemistry at Aberdeen Univ. (1914-19) and later professor of chemistry at Oxford. He retired in 1936. Soddy's work with Rutherford led him to the discovery of isotopes, elements which are identical in chemical behavior but have different atomic weights. For this discovery, which he first made public in 1912, and "for his contributions to the chemical knowledge of radioactive substances," Soddy was awarded the Nobel Prize for chemistry in 1921.

He was the author of many volumes on both science and economics. Among his scientific works were "The Interpretation of Radium" (1909, 1922), "The Chemistry of the Radio-Elements" (1911-14), "Matter and Energy" (1912), "The Interpretation of the Atom" (1932), and "The Story of Atomic Energy" (1949); his books on economics included "Cartesian Economics" (1922) and "Money versus Man" (1931, 1933).

Söderblom (*sû'dẽr-blo͞om*), NATHAN, primate of the Lutheran Church of Sweden, born in Tröno, Sweden, Jan. 15, 1866; died in 1931. He was educated at the Univ. of Upsala and studied for a time in the U.S. From 1894 to 1901, he was rector of the Swedish Church in Paris. He held a chair of theology at the Univ. of Upsala (1901-12) and later became prochancellor of that university. He was appointed Archbishop of Upsala in 1914 and remained in that post until his death in 1931. He was elected to the Swedish Acad. in 1921 and was awarded the Nobel Peace Prize in 1930. A scholar and a Protestant leader of international reputation, Söderblom took a prominent part in the movement for Christian unity to pro-

NATHAN SÖDERBLOM

mote international friendship and spiritual co-operation among the Christian churches. He was particularly active in organizing the Universal Christian Conference on Life and Work which met at Stockholm in 1925. This conference, attended by more than 600 delegates, representing more than 30 communities and over 35 countries, discussed the universal co-operative movement among churches and its relation to economic, social, and moral problems, and international peace. Among Söderblom's writings, most noteworthy are: "The Nature of Revelation," "The Religions of the World," "Christian Fellowship," and "The Church and Peace."

Sodium (*sō′dĭ-ŭm*), a metallic element of the alkalies, of which soda is the oxide. It is closely allied to potassium and has a bluish-white color and a high luster. The specific gravity is .9712. It melts at 97.6° C., readily oxidizes in the air, and decomposes violently when dropped upon water. Sir Humphry Davy obtained the metal of sodium in 1807 soon after he had discovered potassium. Nearly 40 per cent of the immense quantities of common salt that exist in the ocean, in the deposits of rock salt, and in the brine springs may be classed as sodium. Many compounds of sodium have been studied, the uses of which are very numerous in the manufactures. Soda (*q.v.*) is obtained from sodium. It yields peroxide of sodium, carbonate of sodium, and hydroxide of sodium, the last mentioned being frequently called *caustic soda*. To obtain peroxide of sodium, the sodium is burned in oxygen or dry air, while sodium hydroxide is the product of the reaction of sodium with water. Common salt is a compound of chlorine with sodium. Plants growing near or in the sea contain more or less sodium, and it also occurs in many animal fluids. Many uses are made of sodium and its compounds in medicine, and in industry.

Sodium Hexametaphosphate (*sō′dĭ-ŭm hĕk-sȧ-mĕt-ȧ-fŏs′fāt*). See *Phosphate*.

Sodium Lamp (*sō′dĭ-ŭm lămp*), a device for producing light of an intense yellow color. This light is of great spectral purity; it consists of radiation of two definite wave lengths so close together that a doublet is formed. These are designated as the D_1 and D_2 lines of the sodium spectrum (arc) and have wave lengths of 5896 and 5890 respectively. They are of practically equal intensity. Sodium light is used for exacting analytical work in polarimetry (study of rotation of a beam of polarized light on passing through a solution of some substance such as sucrose). It is also used for roadway illumination (see below).

The purity and intensity of the light depends upon the method of generation. Sodium lamps may be conveniently divided into two classes, *i.e.*, thermal lamps and electrical lamps.

Thermal sodium lamps involve the heating of a sodium salt in a very hot flame. Most of these have been designed to give maximum intensity with minimum attention. Pribaum (1895) heated fused sodium chloride (table salt) in a platinum boat with a gas flame from a Bunsen burner, while Schmidt and Haenish devised an automatic-feeding lamp by heating in a flame a pair of parallel platinum wires having the ends immersed in molten salt contained in a spoon. The molten salt flowed *up* the pair of wires by capillary action and was continuously vaporized in the flame. A satisfactory sodium lamp is obtained by heating a stick of sodium carbonate in a hot flame. Recent developments, however, employ another principle in producing radiation for analytical work and illumination.

A sodium lamp manufactured by the General Electric Vapor Lamp Co. and used generally in scientific laboratories employs sodium vapor. The radiating element consists of a glass tube containing sodium vapor and a small amount of mercury vapor or helium to assist in starting the operation of the lamp. An electric current is passed through the tube, and as a result of this passage, the sodium vapor becomes activated and gives off a brilliant yellow light. Theoretically, this light is supposed to result from the return to a normal condition of an electron in the sodium atom which was excited by the passage of the electrical current. Light from an electrical sodium lamp is contaminated by colors (wave lengths) arising from the excitation of other vapors present in the lamp to aid in starting its operation, but these colors can be filtered out fairly readily. The bulb of the lamp is fairly large and of uniform illumination. A European modification having a much smaller working area is called the Osram lamp and has a greater brightness than the American types. Both types are usually operated on alternating current.

The electric sodium lamp may be adapted for highway, tunnel, or general outdoor illumination. Such application takes advantage of two facts: yellow light penetrates systems of droplets of water of the sizes that usually occur in fogs much better than will lights of other wave lengths, and the human eye is more sensitive to yellow light than it is to red or blue or several other colors. These facts, combined with extremely low operating costs for sodium lamps, make them very useful for extended outdoor illumination.

Sodium Pyrophosphate (*sō′dĭ-ŭm pȳ-rō-fŏs′fāt*). See *Phosphate*.

Sodom (*sŏd′ŭm*), an ancient city of Syria, which is mentioned frequently in the Bible in connection with Gomorrah. These two cities were situated near the southern shore of the Dead Sea, though this is disputed by some writers, and the story is that they were destroyed for their wickedness by a shower of fire descending from the heavens. Other cities mentioned in connection with their history are Zeboim, Admah, and Zoar, but it is specially cited that the last mentioned was not destroyed because of Lot's supplication for its preservation.

Sodom, APPLE OF, or DEAD SEA APPLE, the name given by ancient writers to a fruit found in Palestine, especially in the vicinity of the Dead Sea. It is described by Josephus and Strabo as beautiful to the eye, but galling and bitter to the taste, and was said to fill the mouth with ashes. These writers probably have reference to a large gall caused by an insect on dwarf oaks, since they are bitter and are filled with a dry and porous substance.

Soerabaya (*so͞o-rä-bä'yä*). See *Surabaya.*

Sofia (*sô'fē-yȧ*), or SOPHIA, the capital of Bulgaria, on the Bogana River, 175 m. S.E. of Belgrade. It occupies a fine site on a plain between ranges of the Balkan Mts. and is surrounded by a productive region. Sofia has railroad connections with Constantinople, Budapest, and other cities, and is the center of a large trade. It has a number of fine public buildings, several churches and educational institutions, a modern cathedral, and many mosques. It is the seat of the national university and of an archbishop's palace. The Romans knew it by the name of Sardica. It passed successively through attacks waged by various peoples, until it became a Turkish possession in 1382. The Russians occupied it in 1878. With the independence of Bulgaria it was made the capital. When Bulgaria sided with Germany during World War II, Sofia became the target of many blistering air attacks, particularly in late 1943 and early 1944. Population, *ca.* 285,000.

Softball (*sôft'bạl*), a game widely played in the U.S. It was first introduced in 1895 in Minneapolis, Minn., and has since been called diamond ball, playground ball, and indoor baseball. At first the popularity of the game increased slowly but since 1925 interest in the sport has grown immensely. In 1932 the Amateur Softball Assn. of America was formed.

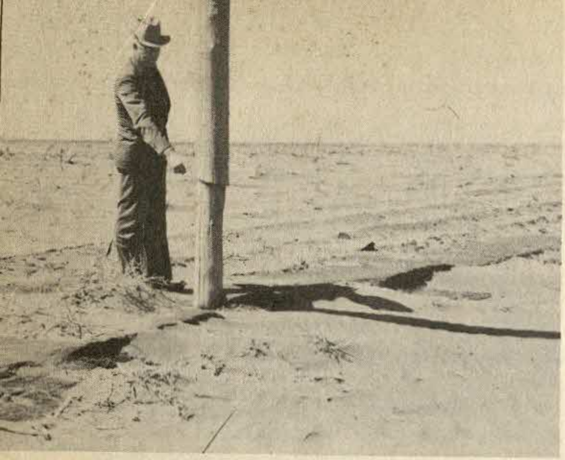
The base lines in softball are 60 ft. long and the distance from the pitcher's box to the home plate is 43 ft. for men, 35 ft. for women. There are two teams, each composed of 10 players whose positions correspond to those in baseball with the exception of the "short fielder," who plays between the infielders and outfielders, behind second base. The softball pitch must be delivered with an underhand motion, the ball being released below the level of the pitcher's hip. The game is seven innings in length and for a game to be counted, at least five full innings must have been played before the umpire ends the game. The softball must weigh between 6 and 6¾ oz. and have a circumference of between 11⅞ and 12⅛ in. The bat used must be no more than 34 in. long and have a diameter of no more than 2⅛ in. at its widest part. Softball rules permit base stealing but the runner cannot leave the base until the ball pitched to the batter has left the pitcher's hands.

Soft Water (*sôft wạ'tẽr*). See *Water.*

Soil (*soil*), that part of the upper stratum of the earth's crust which furnishes nutriment to plants. It is formed partly from particles resulting from the wearing of rocks and the decomposition of vegetable and animal matters. Soil exists wherever the surface is not composed of rocks or covered with water, though the term is sometimes applied in a wider sense to the areas below water that yield vegetable forms. *Drift* soils are the product of glacier action, while *alluvial* soils are those resulting from floods and water in motion. The term *subsoil* is applied to the mass of earth or rock lying beneath the soil proper, and this is usually quite free from a mixture of decayed vegetable matter. The term *transported soil* is applied to that formed from particles of rock carried to lower regions, while *sedimentary soil* results from the disintegration of rocks whose particles are not transported. Soil varies in appearance, composition, and fertility according to the particles forming it, and the particular class of crops that may be profitably cultivated is largely dependent upon its constituents. Among the different substances forming soil are lime, silica, alumina, soda, magnesia, ammonia, and alkalies.

All soils contain a considerable quantity of moisture. They hold intact various metallic oxides as well as hydrogen, oxygen, carbonic acid, and other gases. The fertility of the soil on hillsides gradually decreases because rains wash the more productive parts into the valleys. For this reason it needs to be replenished with manures more frequently than the soils of the more level lands. This circumstance accounts for the fact that the best lands for cultivation and pasturage are found in the valleys along rivers and among hills. Soil loses productiveness by continuous cropping, especially if the crops are not alternated. In arid regions the subsoil is of great importance in retaining moisture, especially if constituted of such strata as serve to prevent the rapid passage of moisture through it. This is especially true if the subsoil is not located more than 2 to 5 ft. below the surface soil. See also *Agriculture; Soil Conservation.*

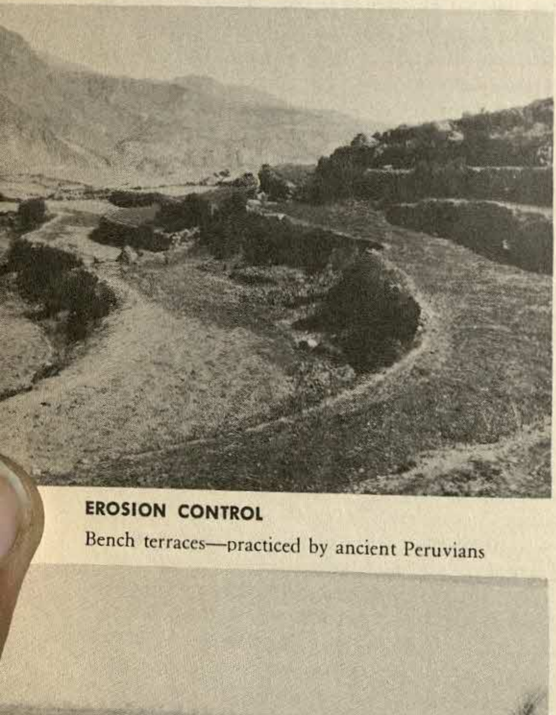
Soil Conservation (*soil kŏn-sẽr-vā'shŭn*), the science and practice of using and conserving agricultural land and the water available for agricultural production. It was developed in the U.S. after about 1930 through research, land surveys, demonstrations of erosion control and related con-



Photos courtesy Soil Conservation Service

WIND EROSION ON DRY LAND

At least 2½ feet of soil was blown away from this spot within fifteen years



EROSION CONTROL

Bench terraces—practiced by ancient Peruvians

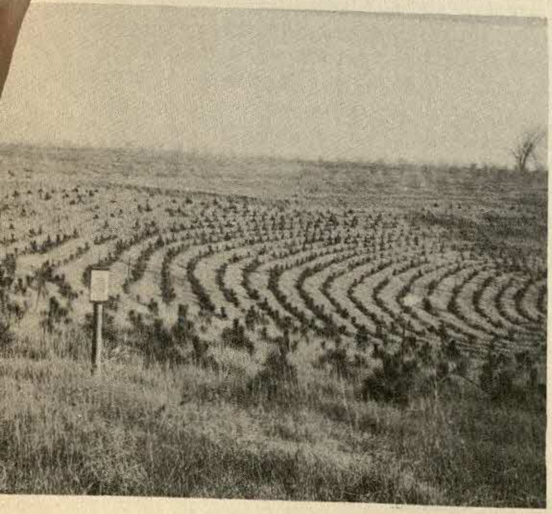
servation practices, and direct technical assistance to farmers and ranchers on their land.

By the close of 1946, the national soil and water conservation program had extended to all 48 states, Puerto Rico, Hawaii, and the Virgin Islands; and some surveys had been made in Alaska. Meanwhile, more than 30 other countries had investigated the U.S. program with a view to instituting similar programs.

Actual work of putting soil conservation practices onto the land now is done principally in soil conservation districts, voted by farmers under permissive state laws and managed by the farmers themselves. Farmers are assisted in planning and applying conservation practices by technicians of the Soil Conservation Service of the U.S. Dept. of Agriculture, though available information and assistance from other Federal, state, or local sources may be drawn upon also. At present, more than two-thirds of the farms in the U.S. are in such conservation districts. They covered more than 900,000,000 acres. Five states were completely covered by such districts, and 25 others were more than half covered.

Nearly 60 soil and water conservation practices have been developed or improved, by scientific experiments and field trials, for use in controlling erosion, conserving rainfall in dry areas, and increasing crop yields on the agricultural land of the U.S. Contour cultivation has been applied to nearly 10,000,000 acres; conservation range stocking to 24,500,000 acres; and crop residue management to about 9,500,000 acres. At the same time, 334,000 m. of terraces and 48,000 farm and ranch ponds have been constructed for control and conservation of rainfall. Other practices widely used in conservation farming include strip cropping, seeding range and pasture lands, growing cover crops and green manure crops, scientific design of drainage and irrigation systems, tree planting and woodland management, building water-diversion structures, grassing of waterways, and planting of eroded fields and gullies.

Soil conservation is based on the principle that if different kinds of land are used according to their capabilities, and treated with conservation methods according to their needs, erosion can be prevented and all soils can be put to profitable use. As a simple and effective guide in carrying out this principle, the land of the U.S. has been divided into eight capability classes, according to soil, slope, amount of erosion, and other factors. These classes range from the best and most easily farmed land (Class I) to land that has no agricultural value except for wildlife (Class VIII). They fall into three groups: land suitable for regular cultivation, usually with use of soil con-



HILLSIDE EROSION CONTROL BY CONTOUR PLANTING OF TREES

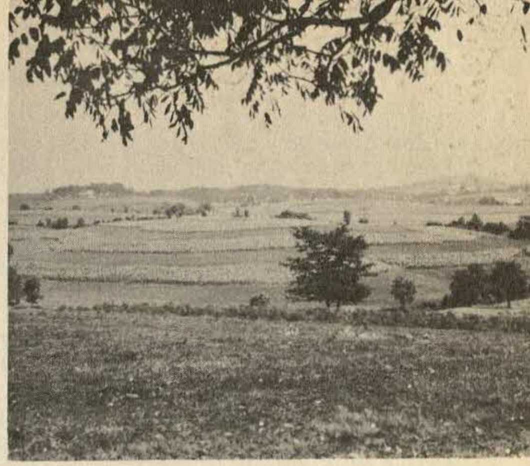
servation practices, land suitable for only limited or occasional cultivation, and land not suitable for cultivation, but only for grass, tree, or wildlife crops.

The main purpose of the soil conservation program is to adjust land uses to fit land capabilities, by applying conservation practices in combinations suitable for controlling soil erosion, managing water, and increasing or stabilizing economic returns from the land. Of the 98,500,000 acres under recent planned, acre-by-acre soil conservation farming, more than 3,000,000 acres of formerly cultivated land had been retired to permanent hay, orchard and vineyard, pasture or range, or to production of trees and wildlife. On the other hand, about 1,000,000 acres of the land formerly in pasture and range was found to be suitable for cultivation, production of permanent hay, orchards, forest, or other uses.

Proper use of vegetation is a major phase of soil conservation. Research is carried on continuously to improve and adapt grasses and legumes to different climatic and soil zones for use in crop rotations, range and pasture seedings, and for planting waterways. Trees, shrubs, and grasses are used extensively for planting eroded areas. Soil conservation nurseries are maintained, by the Soil Conservation Service, for testing promising erosion-control plants, and for increasing seed and seedling supplies of species needed by farmers and ranchers in solving their erosion problems but not yet available in sufficient quantities through commercial sources.

Engineering works used for soil conservation include soil-saving dams, water storage and diversion dams, terraces, flood-control structures for small streams, structural works used in development of springs, ponds, and wells, and ditches, and pipes and flumes for regulating and distributing water to fields in drainage or irrigation.

Conservation work on hundreds of thousands of farms throughout the U.S. has resulted in an average per-acre increase in yields of at least 20 per cent. On many farms which have been under complete soil conservation for three or more years, yield increases now are several times higher. Of immediate concern to soil conservationists is the fact that the main task of applying soil conservation to the land still lies ahead. A recent state-by-state survey revealed that nearly 1,000,000,000 acres of U.S. farmland have yet to be treated with soil and water saving practices. It will require at least 20 more years of work to apply the basic treatment, if technical assistance, labor, machinery, planting and other materials, irrespective of their source, government or private, are made available. By "basic treatment" is meant conservation, surveying and complete planning of the farm, and the application of such practices as terracing, strip cropping, determining of conservation crop rotations, planting tree windbreaks, rehabilitating drainage or irrigation systems, and so on. Thereafter, of course, remains the continuing task of maintaining this soil conservation work year after year.



CONTOUR STRIP CROPPING

Alternate strips are corn and hay, planted under a four-year rotation

Soissons (*swä-sôn̲'*), a city of France, located on the Aisne River, in the department of Aisne. Situated about 65 m. N.E. of Paris, the city, with its famed 12th-century Cathedral of Notre Dame, dates from Roman days. Soissons is famous for the victory achieved here by Clovis over the Roman general Syagrius (486) which ended Roman control of Gaul. It later became the capital of the Frankish kingdom of Neustria. Many ancient Roman and medieval ruins make Soissons a treasure of historic and archeological importance. The town figured as a battleground between German and Allied troops during World War I. Surrounded by rich farmland, Soissons trades in livestock and farm produce; it also produces leather, lumber, and foundry goods. During World War II it was the scene of fighting in 1940 and in 1944. During that period it was in the German zone of occupation. Population, *ca.* 17,500.

Sokoto (*sō'ķô-tô*), a town of Africa, situated in Nigeria, on the Sokoto River, a tributary of the Niger. It has a number of mosques and several government buildings constructed by the British. The manufactures include cotton goods, utensils, jewelry, and earthenware. Sokoto was formerly the capital of the Fula kingdom, an extensive region now included in Nigeria Territory, a British possession. The Fula kingdom, however, became part of the British Empire in 1903 when the Royal Niger Co. transferred its rights to the territory to the British government. The kingdom had originally been founded in the 19th century. Population, *ca.* 2,000.

Sol (*sōl*), Latin meaning sun; in Roman mythology the god of the sun, corresponding to the Greek Helios.

Solanaceae (*sŏl-ȧ-nā′sē-ē*), or the nightshade family, widely distributed tropical trees, shrubs and herbs. The potato, tomato, eggplant, tobacco, and petunia are cultivated species of this family.

Solar Plexus (*sō′lạr plĕḳ′sŭs*), in anatomy, a network of nerves and ganglia situated behind the stomach. Since it is very sensitive, any blow in that area causes shock.

Solar System (*sō′lạr sĭs′tẹm*), the sun and the large number of smaller bodies which, held by its attraction, revolve around it. It includes, beside the overwhelmingly dominating central sun, nine major planets, their 28 satellites, thousands of minor planets and comets, great numbers of meteorites, and the minute particles that produce the zodiacal light and the rings of Saturn. All these bodies, sharing the rapid motion of the sun among the other stars, have evidently had a common origin. Many theories have been proposed to explain the formation of the solar system and especially the regular arrangement of the orbits of the planets. Among these, Laplace's nebular hypothesis held sway for a long time until closer scrutiny showed it to be untenable. Other attempts, attributing the formation of the planets to the encounter of the sun and a star with ejection of masses of solar material, or to the effect of large tidal forces, have proved only partially successful in explaining the present status of the system.

Name	Mean Distance to Sun Earth = 1	Period in Years	Mean Diameter Earth = 1	Mean Density Earth = 1	Axial Rotation Hours	Number of Moons
Mercury	0.387	0.241	0.39	0.76	2,112(?)	0
Venus	0.723	0.615	0.97	0.89	(?)	0
Earth	1.000	1.000	1.00	1.00	23.56	1
Mars	1.524	1.881	0.53	0.70	24.37	2
Jupiter	5.203	11.862	10.97	0.24	9.50	11
Saturn	9.539	29.457	9.03	0.13	10.14	9
Uranus	19.191	84.013	4.00	0.23	10.40	5
Neptune	30.071	164.783	3.90	0.29	15(?)	2
Pluto	39.518	248.421	(?)	(?)	(?)	0

Solder (*sŏd′ẽr*), a fusible alloy used for joining metallic surfaces or margins. It must be more highly fusible than the metal or metals to be united, and with this object the components and their relative amounts are varied to suit the character of the work. In the ordinary process of soldering small particles, two metallic surfaces are placed together, and a small quantity of solder is melted from the stick or cake by a soldering iron, which has been previously heated in a furnace. The hot iron is applied to the joint for the purpose of forming the solder into a uniform fluid and, after equalizing its distribution, the exposed surface is carefully smoothed. It is necessary to have the surfaces cleaned perfectly by scraping before joining them, and generally muriatic acid or sal ammoniac is used to remove all particles of foreign matter, else the solder will not become firmly fixed. A hard solder made of gold and copper, or gold, copper, and silver, is employed for soldering gold; while a solder of silver and brass is used in soldering silver. The soft solders used in ordinary work are formed of equal parts of lead, tin, and bismuth, or equal parts of lead and tin.

Sole (*sōl*), a flat fish. The American sole, also called *hogchoḳer,* is about 6 in. long, while the European sole is 10 to 20 in. long.

Soley (*sō′lĭ*), JAMES RUSSELL, jurist and author, born in Roxbury, Mass., Oct. 1, 1850; died Sept. 11, 1911. He studied at Harvard, was admitted to the bar, and taught English for a year at the U.S. Naval Acad. In 1872 he was made professor of history and law at the same institution. In 1890, he was made Assistant Secretary of the Navy, serving until 1893, when he began the practice of law in New York City. He was counsel for Venezuela in 1899 at the arbitration of the boundary between Venezuela and British Guiana. He published "Foreign Systems of Naval Education" and "History of the Naval Academy."

Solferino (*sŏl-fĕ-rē′nō*), a town in Northern Italy, 20 m. N.W. of Mantua, in the province of Brescia. It is celebrated as the site of a famous battle between the Austrians under Emperor Francis Joseph and the French and Sardinians under Napoleon III and Victor Emmanuel, which occurred on June 24, 1859. It terminated in the overwhelming defeat of the Austrians, who lost 20,000 men in the battle that continued for 16 hours, while the allied army lost 18,000. The victory was decisive in the fight for Italian independence. The town has a tower known as the Spy, from which the plains of Lombardy may be viewed.

Solid (*sŏl′ĭd*), in physics, a substance that is held in a fixed form by cohesion among its particles, and thus excludes any other material particle or atom from occupying the same space. In a solid the molecular attraction is stronger than molecular repulsion, but it varies greatly in different solids. This property distinguishes a solid from a liquid or a gas, which offer little resistance to influences that tend to change their shape. The term solid is applied in geometry to any magnitude that has length, breadth, and thickness. In this sense it is a part of space bounded on all sides, but the term volume is sometimes substituted for solid. See *Matter*.

Solipsism (*sŏl′ĭp-sĭz′m*). See *Epistemology*.

Solitaire (*sŏl-ĭ-târ′*), the name of a game of cards played by one person, supposed to have been invented by a prisoner confined in the Bastille (*q.v.*). Originally the game was played with glass balls, but now it is usually with an entire pack of cards. The purpose is to play until, after consecutive manipulation, the entire number of cards is placed in consecutive order in four piles, according to the suits. The game has many variations.

Solomon (*sŏl′ô-mŭn*), the third King of Israel, who reigned for 40 years, *ca.* 970-930 B.C. The stories about Solomon are told in the Old Testament in the Books of II Samuel, I and II Kings, and I and II Chronicles. They were written several hundred years after his death and differ according to the views of the various periods to which they belong. Solomon is usually described as the second son of David and Bathsheba; however, in the lists of David's children, he figures as the fifth son. According to one narrative (I Chron. 22:9) David was directed by Yahweh (Jehovah) to give his son the name of Solomon, meaning peaceful. Another story relates that the prophet Nathan gave Solomon the name of Jedidiah (beloved of Yahweh) as a promise that God would be gracious to him (II Sam. 12:24). Although not the eldest son, Solomon was chosen by David as his successor. Of Solomon's brothers, Amnon was slain by Absalom, and Absalom was killed in an attempted revolt against his father. Adonijah promoted an intrigue to gain possession of the throne, and this was perhaps the reason for Solomon's accession before David's death. It also explains why Solomon was obliged to put his adversaries to death at the beginning of his reign.

Solomon's long reign was perhaps the most prosperous and peaceful in the history of the Hebrew nation. An important story in the tradition about Solomon relates that shortly after he came to the throne, he made a thousand burnt offerings on the brazen altar at the ancient city of Gibeon. When God later appeared to him in a dream offering him a gift, Solomon chose wisdom rather than wealth or power, and as reward was granted all three.

Solomon is noted as a wise and excellent administrator, the first Hebrew king to enter into extensive and friendly relations with other powers. So great was his wisdom and the glory of his kingdom that the Queen of Sheba traveled some 1,500 m. to visit his court. Although he undoubtedly secured his inheritance by military means, he made no attempt to extend his dominions. Instead, he formed alliances with his neighbors, to the military and political advantage of all. By his marriage to the daughter of the Pharaoh of Egypt he gained the friendship of a great nation and obtained the important fortified city of Gezer. His alliance with Hiram, King of Tyre, made it possible for him to embark on extensive commerce with the great cities of the Mediterranean and perhaps also the Red Sea. He is said to have possessed with Hiram a large fleet of ships for regular trading in the Mediterranean. He brought back gold and silver, precious woods, ivory, gems, peacocks, horses, chariots, and apes, and exchanged domestic corn, oil, and wine for building materials and Phoenician artisans.

Solomon's court was one of fabulous luxury and wealth. He was particularly interested in building and, besides fortifying a number of cities, constructed a magnificent royal palace, the labor on which extended over 13 years. A devout worshiper of Yahweh, he also spent seven years in building a great temple. From a religious point of view, he was criticized by some of his chroniclers because he also erected temples to the gods of other nations and took part in their ceremonials. It seems likely that his reasons were political rather than religious; moreover, the women of his great harem belonged to various nationalities and religions.

Continued contacts with other nations of the civilized world brought an enormous stimulus to intellectual and cultural progress. Solomon's extensive building program, carried on largely by Phoenicians, introduced new arts and completely changed the architecture of the capital city of Jerusalem. Solomon himself is supposed to have been an excellent and prolific writer; however, we have little record of this since the works attributed to him (the Proverbs, the Canticles, the Wisdom of Solomon, the Psalms of Solomon, and the Odes of Solomon) apparently belong to other later periods.

The ending years of Solomon's reign evidently showed the results of extravagance. A heavy tax burden made the country restive. Solomon's cosmopolitan court had encouraged the introduction of other religions, and his prosperity had brought him enmities with other rulers. His successor, Rehoboam, therefore, faced conditions which could only lead to the break-up of the kingdom. See also *Jeroboam I; Jews.*

Solomon Islands (*sŏl′ô-mŭn ī′lạndz*), an island group in the Pacific Ocean, lying about 500 m. E. of New Guinea and N. of the New Hebrides. It is one of the most extensive groups in the Malay Archipelago, containing a large number of more or less important islands. The total area is about 17,000 sq. m. The group is well watered. It has a damp climate and several chains of lofty mountains, some of which attain heights of 8,000 ft. above the sea. The highlands have a climate favorable to Europeans. Among the principal products are yams, coconuts, rice, cotton, fish, poultry, swine, sugar, and many species of tropical fruits. These islands were first discovered by the Spanish in 1567, but were rarely visited until in the last century. By a treaty between

Germany and Great Britain, in 1885, the islands became possessions of these two nations, the northern part being subject to Germany and the southern part to Great Britain. Australian troops occupied the German islands during World War I and after the war they were given under mandate to Australia. The inhabitants are Polynesians of small stature and speak a language of the Malay type.

During World War II, Japanese troops attempting to penetrate to Australia, made landings on the Solomon Islands for the first time on Jan. 23, 1942. U.S. Marines launched a counterattack on Aug. 7, retaking parts of the island and concentrating their greatest strength on Guadalcanal and Tulagi. By the end of October 1943, the entire archipelago had been cleared of Japanese forces. Population, *ca.* 200,000.

Solomon, SONG OF, or SONG OF SONGS, or CANTICLES, a book of the Old Testament. Attributed to Solomon (*q.v.*), the book more probably is an anthology of poems collected about the 3rd century B.C. It is concerned with love. In part, it is a dialogue between bride and bridegroom, including, as well, their individual reactions to their marriage. From this book comes "the voice of the turtle is heard in the land" (Song of Solomon 2:12) and other descriptions of spring. The rabbis interpreted the book as an allegory of the relations between God and His people, and the Christian Church continued this allegorical interpretation, but referred it to the relationship between Christ and the Church. See also *Canticles*.

Solomon's Seal (*sŏl'ô-mŭnz sēl*), a class of perennial herbs of the lily family, allied to the asparagus. The leaves are sometimes eaten as greens. The stem attains a height of from 6 in. to 4 ft., bearing sessile leaves and nodding, greenish flowers. A number of the species are native to North America, especially the *great Solomon's seal*. Several species are common to Europe. These plants bear a bluish-black berry, which is purgative. In most species the rootstalks are thick and knotted, with scars on their upper surface, due to the falling away of old stems growing vertically.

Solomon, WISDOM OF, a book of the Apocrypha, sometimes called the *Book of Wisdom*. It consists of three parts. In the first it attacks the philosophy of Greece, especially that of the Epicureans, and shows that spiritual ruin comes to those who are absorbed in worldly affairs. The second part eulogizes wisdom and relates how Solomon came to choose it for his companion. In the third part the influence of wisdom upon the history of Israel is illustrated, and the evils of folly practiced by the heathen nations is put to scorn. See also *Bible*.

Solon (*sō'lŭn*), the great legislator and one of the seven wise men of Greece, born in Athens in 638; died in 558 B.C. He was descended from a distinguished family of Attica. He traveled widely as a trader after his father lost much of his wealth. The martial inclination of the Athenians had been crushed by reverses, but Solon revived the spirit of nationality and stirred his countrymen to recover Salamis. This he effected by writing patriotic poems, which were quoted throughout the nation, and he shared in the glories by commanding the army sent from Athens. Subsequently he was a highly influential citizen and became chief archon in 594 B.C. It was a period of conflict between the peasants and nobles, but wise application of his authority prevented a revolution.

SOLON

Solon wrote a new constitution that enlarged the powers of the assembly. This document made property instead of birth the basis of citizenship, thus admitting the common classes as factors into the government, and it vastly improved economic conditions by abolishing the provision under which a debtor could be reduced to slavery by his creditor. Luxury in dress and food were prohibited, the ownership of land was limited, and the general education of youth in schools and gymnasiums was provided for by statutory law. The statutes of Solon were written on pieces of wood and the Athenians were bound by oath not to repeal them for 10 years, after which he went on extensive travels to avoid being requested to alter his laws.

He spent 10 years in traveling through Asia Minor, Cyprus, Egypt, and Lydia, but, on returning to Athens, he found that the greed of the nobles had again caused serious dissensions. All parties still had such confidence in him that they readily submitted to his decisions, but later Pisistratus seized the sovereignty and overthrew the political constitution, though he allowed the social legislation of Solon to remain in effect. The story is told that Croesus, King of Lydia, asked Solon to state who could be counted the happiest man, and he replied: "Tellus of Athens, who died at the time his country was prosperous and just after he had defeated its enemy." Not satisfied with the reply, Croesus asked a second time, when Solon answered that in his judgment two Argive youths could be counted exceedingly happy, because the gods had permitted them to die in their sleep as a reward for an act of kindness. Few of the writings of Solon have come down to us, those generally thought to be from his pen being included in the collections of the Greek gnomic poets.

Solstice (*sŏl′stĭs*), the period in the annual revolution of the earth around the sun at which it reaches its greatest northern or southern declination. This gives rise to two solstices in the year. The *summer solstice* occurs on June 22, when the sun shines directly upon the Tropic of Cancer, while the *winter solstice* takes place on Dec. 22, at which time the sun appears to traverse the Tropic of Capricorn. The sun is commonly said to stand still for several days before and after the solstice, because the apparent declination of its rays is very slight.

Solution (*sô-lū′shŭn*), the process by which a body is absorbed into a liquid, by means of a fluid termed the *solvent,* or *menstruum.* The product is also called a solution, and may be formed of a solid, a liquid, or a gas. Thus, if water is poured upon a quantity of sugar, the solid sugar will take on the liquid form, the water serving as the solvent. Water dissolves many solids and is used extensively as a solvent, but some solids require alcohol, ether, and other liquids to become dissolved. Only a given quantity of a solid can be dissolved in a liquid, since adhesion and cohesion balance each other at a given point, when the liquid is said to be *saturated.* Some solids are partly dissolved by heat, as gum camphor, but there are notable exceptions, as in the case of water immediately above the freezing point, at which temperature it will dissolve a larger quantity of lime than when at the point of boiling. Many liquids dissolve other liquids and gases, as in the solution of alcohol in water, but the latter will not dissolve oily liquids. Oils, on the other hand, may be dissolved by ether and benzene. However, water is a solvent of ordinary air and carbonic acid gas.

Solway Firth (*sŏl′wâ fĕrth*), an inlet from the Irish Sea, forming a part of the boundary between Scotland and England. It extends inland toward the northeast a distance of 38 m., receives the water from the Eden and Nith Rivers, and has valuable salmon and other fisheries. The tides ebb and flow with great rapidity, usually from 8 to 10 m. an hour, and the inflowing waves attain a height of from 3 to 6 ft. At ebb tide large sandy tracts of the firth are left dry.

Solyman I (sometimes SOLYMAN II) (*sŏl′ĭ-mạn*), or SULEIMAN, surnamed *The Magnificent,* Sultan of Turkey, born 1496; died 1566. He was the son of Selim II, whom he succeeded in 1520. Immediately after his succession, he reformed the civil service. After establishing schools and internal improvements, he suppressed a revolt in Syria, subdued the Egyptian Mamelukes, and made a peace treaty with Persia. In 1521 he captured Belgrade, the key to Hungary, and in 1522 made a successful attack on the Knights of St. John in Rhodes. They were defeated, and their power and influence were limited materially. His reforms at home caused a revolt of the Janizaries, but he engaged them in a war against Hungary, winning a signal victory at Mohacs in 1526, and, after capturing Buda and Pesth, he laid siege to Vienna. However, his attack on Vienna proved disastrous, and he was required to withdraw from the siege in 1529 with a loss of 40,000 men. He returned to Hungary with a large army in 1531, where he was successfully opposed by Charles V of Germany, but he concluded a treaty with the French, opening the Levant to the latter, and in 1542 ravaged Nice and the Italian coasts. Peace was restored with Germany in 1547. He soon after invaded Armenia and Persia, and subsequently enlarged his dominion in Northern Africa. In 1561 he won a naval victory over the Knights of Malta and in 1565 renewed his attacks on Hungary. He died while he was laying siege to the Hungarian town of Szigeth.

SOLYMAN I

Somaliland (*sô-mä′lê-lănd*), a strip of land extending along Africa's eastern coast from Eritrea in the north to Kenya in the south, forming a pocket into which fits the eastern extremity of Ethiopia. The territory is divided among Great Britain, Italy, and France.

Somaliland Protectorate is a British protectorate located on the shelf of the African continent directly south of the Gulf of Aden. Area, 68,000 sq. m. The population is largely Mohammedan and almost entirely nomadic. The principal products are skins and hides, gum and resins, cattle, sheep, and goats. The chief imports are textiles, rice, and sugar. Berbera is the chief city and seaport, other cities being Hargeisa, Burao, and Zeilah. The East India Co. inaugurated England's interest in Somaliland, seeking a safe harbor for their ships midway between the home ports and the East Indies. Treaties were signed in 1840, but in 1874 the Egyptian ruler invaded the country. When Egyptian troops had been expelled, the British assumed a protectorate over the territory (1884). During World War II, Italian forces occupied the country from August 1940 to March 1941, when the British expelled them. Somaliland was under military administration from March 1941 to November 1948, when it was restored to civil administration. Population, *ca.* 700,000.

French Somaliland is located north of the British Protectorate at the point where the Red Sea joins the Gulf of Aden. Area, 9,071 sq. m. Salt is mined and other minerals known to exist in the region are gypsum, mica, amethyst, sulfur, etc. Coffee, hides and salt are the chief exports. It is administered by a governor and an administrative council; it is represented by one deputy and one senator in the French assembly. France gradually acquired control of the region between 1864 and 1888. Following the surrender of France in 1940, it declared its allegiance to the Vichy regime, but in 1941 it surrendered to the forces of Gen. de Gaulle. In 1949 the area was declared a free customs territory. Djibouti is the seat of government and chief town. Population of the colony, 1946, 46,448.

Italian Somaliland, or somalia, extends from British Somaliland in the north to Kenya. Area, 194,000 sq. m. Cattle raising and agriculture are the chief occupations of the people. Principal products are sesame oil, gum, hides, butter, cotton, resin, fruit, and bananas. Italian control over the region dates back to 1889. In 1936, following the Italian conquest of Ethiopia, the latter country, Italian Somaliland, and Eritrea were joined to form the territory of Italian East Africa. The capital and chief town is Mogadiscio (population, 55,000). During World War II, British forces occupied the colony in February 1941. Under the terms of the Italian peace treaty (February 1947), Italian Somaliland was surrendered to the Big Four. By a postwar decision of the U.N., it was placed under Italian trusteeship for 10 years (until 1959-60), with the promise of independence thereafter. Population, 1947, 971,000.

Somatology (*sō-mà-tŏl'ô-jĭ*), in anthropology, the science which deals with all the physical aspects of man. Somatologists have specialized in the study of human varieties (races) in the endeavor to classify their differences, the probable causes of these differentiations and the relationship they bear to one another. Recently somatologists have begun the study of group differences, *i.e.*, in growth rates, blood types, differences in musculature, time of sexual maturation, metabolic rates, disease immunities, etc. The process of classifying people thus is known as *somatotyping*. Many of the scientists' findings may be of practical value—for example, adjustment of a particular type to certain altitudinal and climatic conditions. On the basis of somatological investigations resistance to certain diseases can also be traced and measured.

Somersetshire (*sŭm'ẽr-sĕt-shẽr*), a coastal county in southwestern England. Its 1,615 sq. m. contain hills, moors, valleys, and marshes; the principal river is the Bristol Avon. Some of the land, below sea level, is protected from inundation by sea banks and sluices. Of the hills running east and west, the Mendips are most important. This region is noted for dairy products, including the famed Cheddar cheese, wheat and barley, fruits, and livestock. Coal mining and limestone quarrying are important. Manufactures include textiles, gloves, and aircraft. Tourist trade is a major source of revenue, especially at the famous spa of Bath. The capital is Taunton. Population of the county, 1950 (est.), 533,280.

Somersworth (*sŭm'ẽrz-wûrth*), a city of Strafford Co., in southeastern New Hampshire, on the Salmon Falls River 5 m. n. of Dover. It is located on the Boston & Maine R.R. An industrial city, it manufactures cotton and woolen textiles, shoes, electric meters and switches, farming implements, and machinery. Abundant hydroelectric power is available. First settled in 1729, Somersworth was incorporated as a town in 1754 and as a city in 1893. Population, 1940, 6,136; in 1950, 6,927.

Somervell (*sŭm'ẽr-vĕl*), brehon burke, army officer, born in Little Rock, Ark., May 9, 1892; died in Ocala, Fla., Feb. 13, 1955. A graduate (1914) of the U.S. Military Acad., Somervell was commissioned an engineering officer. He fought in Europe in World War I and remained on occupation duty until 1920. He worked on engineering projects in the U.S. and, in collaboration with Walter D. Hines (1870-1934), on a League of Nations survey of the Rhine (1924-25) and an economic survey of Turkey (1933-34). In 1936 he went to New York City as W.P.A. administrator, supervising, among other projects, the construction of La Guardia Airport. In 1940 he was made chief of the construction division of the Army Quartermaster Corps, and in 1941 he was made assistant chief of staff in charge of supply for the War Dept. He was placed in command of the Army Service Forces in 1942, and in 1945 he was advanced to full general. A year later he retired.

Somerville (*sŭm'ẽr-vĭl*), a city in Middlesex County, Massachusetts, on the Mystic River and on the Boston & Maine R.R. It is primarily a residential suburb of Boston. Among its features are the Oliver Tufts House, a military headquarters during the Revolution; the site of Ten Hills Farm, which belonged to Gov. John Winthrop (*q.v.*); and the Old Powder House. On Prospect Hill, Washington raised the first colonial flag in 1776. The leading industries are meat-packing, foundries, automobile-assembly plants, machine shops, and paper mills. Somerville, built upon seven hills, was first settled *ca.* 1631. A part of Charlestown for many years, it was set off as a separate town in 1842 and incorporated as a city in 1871. Population, 1940, 102,177; in 1950, 102,351.

Somerville, MARY, scientist and mathematician, born in Jedburgh, Scotland, Dec. 26, 1780; died in Naples, Italy, Nov. 29, 1872. She was almost entirely self-educated. After her presentation (1826) of a paper on the violet rays of the solar spectrum before the Royal Society, she was deputed to translate and popularize the *"Mécanique céleste"* of P. S. de Laplace (*q.v.*); her translation appeared in 1831. Her other works include "The Connection of the Physical Sciences" (1848) and "On Molecular and Microscopic Science" (1869). Somerville Coll., in Oxford Univ., was established in her memory.

Somme (*sôm*), a river in the northern part of France, which rises in the department of Aisne and flows into the English Channel after a course of 152 m. Canals connect it with the Seine, the Oise, and the Scheldt. It is navigable to Amiens. The Somme Valley was a battlefield in World War I, and the Germans opened an offensive along the west shore of the river in their World War II drive through France, June 1940.

The department of the Somme (with an area of 2,443 sq. m.), in northern France, was formed in 1790 out of a large part of the province of Picardy and a small portion of Artois. It is bounded on the west by the English Channel, and, although there are many fishing ports, the area is primarily agricultural. It raises sugar beets, cereal grains, flax, hemp, potatoes, and colza. The chief cities are the capital, Amiens, Abbeville, Montdidier, and Péronne. Population, 1946, 441,368.

Somnambulism (*sŏm-năm'bû-lĭz'm*), in medicine, a kind of trance during which a person may move about, speak, and perform a variety of actions about which he has no recollection in his normal waking state. It is not uncommon in childhood as an expression of anxiety and stress, and continued sleepwalking should be discussed with a psychiatrist. Contrary to common belief, injury during sleepwalking does occur; awakening a somnambulist has no dangerous effects. A somnambulistic state may be produced by hypnosis (*q.v.*). Somnambulism is also known as sleepwalking.

Sonar (*sō'när*), a coined word originally given to apparatus for navigation by sound, but later applied to apparatus for underwater detection. Sonar was used during World War II by the U.S. in the Pacific to locate submerged Japanese submarines, underwater obstacles, and mine fields. Essentially, it consists of an oscillator and amplifier which send out sound waves (*not* electromagnetic waves), a receiving apparatus, and a suitable indicator. Sound waves cannot travel in a vacuum, but must have a medium to conduct them, and their rate of speed depends on the medium through which they are traveling. Where air is the medium, they travel at the rate of 1,100 ft. per second (330 meters). In liquids or solids, they travel more rapidly. Under water they travel at the rate of 4,800 ft. per second. When sound waves strike a solid body, they are reflected back to their source as echoes. In the sonar apparatus, the echoes are received by a microphone and amplified, or changed to operate an indicator. Underwater sound-detection apparatus required much study and many experiments before it achieved a fair degree of efficiency, because sound waves are affected by changes in the medium through which they pass. Thus, where sound passes through two ocean currents of different temperatures there is a refraction of the echo. Similarly, wave motion, noises made under water by various sea life (such as fish), false echoes, and other interferences necessitate careful and trained interpretation of the data provided by sonar.

Sonata (*sô-nä'tȧ*), in music, a composition, generally of three or four movements, written either for a solo instrument such as the piano or for a solo string instrument with piano accompaniment. The various movements are usually in contrasting tempos and different in character, composed in different but related keys. The sonata dates back to 16th-century Italy; the height of sonata composition lies within the classical period of music and is associated with the names of Haydn, Mozart, and Beethoven. The first movement is usually in sonata form.

The SONATA FORM, also called sonata-allegro form, was developed largely in the 18th and 19th centuries. In a typical movement written in this form, the composer presents two, or three, themes (exposition), modifies and develops the themes (development), and then restates the themes in their original forms (recapitulation), often adding to the three essential sections a coda. Certain key relationships are maintained in each of the sections of the movement. Sonata form is also used in concertos and symphonies.

Song (*sông*). See *Lied; Music*.

Song of Songs. See *Canticles; Solomon, Song of*.

Sonnet (*sŏn'ĕt*), a lyric poem made up of 14 iambic pentameter lines which rhyme in accordance with one of several quite definite patterns. Thus the *Petrarchan*, or *Italian*, sonnet is divided into two groups of eight and six lines, respectively, called the octave and the sestet. In the octave the first, fourth, fifth, and eighth lines rhyme with one another, as do the second, third, sixth, and seventh lines. The sestet includes either two or three rhyming sounds arranged in varying patterns except that they never fall in three couplets. Thus if each letter is taken to stand for a different rhyming sound, the Petrarchan sonnet rhymes as follows in the octave: *abbaabba*. In the sestet it rhymes *cdcdcd, cdecde, cdcdee*, or in some similar pattern. There is usually a shift in thought at the end of the octave of a Petrarchan sonnet corresponding to the shift in the rhyme scheme. Consequently the Petrarchan sonnet is usually printed as if it were two stanzas or paragraphs.

The Petrarchan or Italian sonnet form is the most exact, the most important, and the most widely used, but two other sonnet forms are worthy of note: those used by Spenser and Shakespeare. The *Spenserian* sonnet rhymes as follows: *ababbcbccdcdee*. This complex rhyme scheme results in a close linking of the first 12 lines but at the same time has the effect of beginning a new rhyming pattern at the end of each group of four lines. Thought divisions usually come at the end of the fourth, eighth, and 12th lines.

Shakespearean sonnets have somewhat simpler form, giving the effect of three stanzas of four lines each and a final couplet, for Shakespearean sonnets rhyme as follows: *abab cdcd efef gg*. There is usually a division in thought at the end of the fourth, eighth, and 12th lines of a Shakespearean sonnet, with the sharpest break coming usually at the end of the 12th line. Indeed, it is a weakness of some of Shakespeare's own sonnets that the couplet occasionally seems to be an afterthought appended to an already complete 12-line poem.

The Petrarchan, Spenserian, and Shakespearean sonnet forms are named respectively for their chief practitioners, but sonnets have been written in great numbers by many other poets in many languages, *e.g.*, Dante and Tasso in Italian, Goethe in German, Milton and Wordsworth in English.

The sonnet is usually thought of as a love poem, and love is frequently its subject. But the sonnet has been used for a great variety of other subjects as well. Wordsworth, for example, uses the sonnet for devotional lyrics and for nature poems. Milton uses it to comment upon political events and political leaders, to comment upon his own blindness, to praise his friends, and even to invite his friends to dinner. Sequences of sonnets (*e.g.*, Shakespeare's) frequently are tied together by a thread of narrative.

Son of God (*sŏn of gŏd*), in the New Testament, a title for Jesus Christ.

Sons of Liberty (*sŏnz of lĭb'ĕr-tў*), the name assumed by a society organized in Connecticut in 1755, the object being to promote religious liberty. Col. Isaac Barré, in a speech in Parliament on Feb. 6, 1765, applied the phrase to the party in America who opposed the enactment of the Stamp Act. The name was afterward adopted by a number of societies who favored the separation of the colonies from Great Britain, many of which were secret organizations.

Sons of the American Revolution (*rĕv-ô-lū'shŭn*), a hereditary, patriotic organization, founded in New York City in 1876 and incorporated by act of Congress in 1906. Aimed at fostering American patriotism and perpetuating the memory of those who achieved American independence, membership is open to direct male descendants of an ancestor who actively aided the Revolution, as an officer, soldier, sailor, marine, militiaman, or minuteman. Membership, in 1947, numbered approximately 1,200.

Sontag (*zŏn'täg*), HENRIETTE, singer, born in Coblenz, Germany, Jan. 3, 1806; died in Vera Cruz, Mexico, June 18, 1854. After studying in her native city, she took a classical musical course at Prague. Afterward she appeared successfully in Vienna, Berlin, Paris, Hamburg, and other European cities. In 1829 she married Count Rossi, an Italian nobleman, but reappeared on the stage in 1849, meeting with enthusiastic reception both in America and Europe. She made an extensive tour of the U.S. and afterward went to Mexico, where she died of cholera.

Soochow (*sōō'chou*) or WU-HSIEN, also Suchow, a city and former treaty port (*q.v.*) in eastern China, in the province of Kiangsu, on the ancient Grand Canal, 55 m. w. of Shanghai and 40 m. from the mouth of the Yangtze River. The city is in a heavily populated agricultural area and because of its many canals has sometimes been called the "Venice of China." It has flourishing trade and manufactures, including cotton and silk textiles and food products, and is a rail junction. The old part of the city is enclosed by a wall 10 m. long, dating from the 17th century, and it is famous for its beautiful bridges, palaces, and pagodas, especially the 12th-century Great Pagoda. Soochow dates from about 1000 B.C. and was the capital of Wu, an ancient kingdom (513-473 B.C.), hence the alternate name, Wu-hsien. It received its present name about the 7th century A.D. From 1937 to 1945 the city was held by the Japanese. Population, 1953, *ca.* 475,000.

Soong (*sŏŏng*), name of an influential Chinese family that includes four prominent members, a brother and three sisters. SOONG TSE-VEN, financier, was born in 1891. Educated at Harvard and Columbia universities, he was chairman (1935-43) and vice chairman (1945-50) of the Central Bank of China. He served the national Chinese government as minister of finance (1925-33), foreign minister (1941-44), and premier (1944-47). From 1947 to 1949 he was governor of Kwantung province. SOONG AI-LING was born in 1888. Educated at Wesleyan Coll., Georgia, she married H. H. Kung, minister of finance in the national government (1933-38) and governor of the Central Bank of China (1933-38, 1944-45). SOONG CH'ING-LING, politician and welfare worker, was born in 1890. A graduate of Wesleyan Coll., in 1914 she married Sun Yat-sen (*q.v.*), founder of the Chinese republic. After his death (1925), she rose to a high position in government and in 1959 was chosen a vice chairman of the Chinese People's Republic. SOONG MEI-LING married Chiang Kai-shek, president of the Nationalist government (*see Chiang Kai-sheḳ, Madame*).

Soot (*sŏŏt*). See *Lampblacḳ.*

Sophia (*sô′fē-ạ*), a city in Bulgaria. See *Sofia.*

Sophia (*sō-fē′ạ*), CHURCH OF ST. See *Hagia Sophia.*

Sophia (*zô-fē′ä*), electress of Hanover, born in 1630, died in 1714. She was the daughter of elector (1610-23) Frederick V of the Palatinate (later king of Bohemia) and of Elizabeth, daughter of James I of England. She married Ernest Augustus, first elector (1692-98) of Hanover, and their son became George I (*q.v.*) of England, first of the house of Hanover.

Sophia Alekseevna (*sôf′yă ŭ-lyẹ-ḳsyă′yẹv-nŭ*), regent of Russia, born in 1657, died in 1704. The daughter of Czar Alexis, she ruled Russia as regent (1682-89) for her brother and half-brother, Ivan and Peter (see *Peter I*) until Peter overthrew her and ordered her confined to a convent.

Sophists (*sŏf′ĭsts*), members of a school of Greek philosophy which flourished at the time of Pericles and Socrates, the second half of the 5th century B.C. Although Socrates and Plato fought vigorously against this school, its great contribution to the establishment of a real, liberal, comprehensive education in Greece cannot be denied. By teaching philosophy, the Sophists supplemented the customary instruction, which emphasized gymnastics and the elements of reading, writing, and some forms of art, especially music. Socrates and Plato repudiated the Sophists because they charged a fee for their instruction and because they emphasized too much, in the two men's opinion, the formalities of logical deduction, what we would call today the "philology" and "grammar" of philosophy. Thus, according to Plato and Socrates and, later, Aristotle, they were responsible for developing in their students more the formal aspect of knowledge than a desire for the real seeking of truth, and our modern word "sophist" still has this connotation.

Actually the Sophists, among whom were Protagoras, Gorgias, Critias, and Hippias of Elis, were the rightful rulers of the intellectual life of Greece before Socrates, because they actually created the language and logical instruments of philosophy. Their intramural fights and arguments and their mutual criticism of each other's systems created systematical philosophy.

The Sophists also stressed rhetoric (*q.v.*). Since some of them taught the technique of discussion by speaking both for and against a subject, many of them developed into superficial orators and sometimes falsified the truth which they were allegedly seeking, but only a minority of the Sophists can be identified with this group. No writings of the Sophists are preserved and since all our knowledge of them comes from antagonists like Socrates and Plato, who came after them, our opinion of them is likely to be perhaps more derogatory than they might deserve. We still call people who indulge in logical dialectics and who twist ideas around "sophists." A sophism still means a deceiving conclusion which seems to be logical but actually is ambiguous and only half true. These expressions go back to the alleged technique of the Sophists of turning around the real meaning of a thing by mere logical techniques and so making the worse appear the better course of action. Even this tendency of the Sophists may be defended to a certain degree, however. The youth they taught, in Athens and other Greek cities, were more interested in the techniques of deploying thoughts to achieve the success of their political ideas than in purely theoretical learning. They were more interested in learning how to persuade than how to convince—or, as we might nowadays put it, more interested in propaganda than enlightenment. Thus they represent the greatest intellectual opponents of Socrates, who always strove for absolute knowledge.

Sophocles (*sŏf′ô-ḳlēz*), the greatest of the Greek tragic dramatists, born near Athens, Greece, in 495 or 496 B.C.; died in 405 B.C. As the son of a well-to-do family, he received an excellent education. That he early excelled in the liberal arts is proved by the fact that his par-

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ticipation in the celebration of the Greek victory over the Persians in the Battle of Salamis is mentioned although he was only 15 or 16. In 468, he won for the first time the annual Athenian competition for the best play, defeating the then most famous Greek dramatist, Aeschylus. Between 468 and 441, he won the first prize in these annual competitions more than 20 times and the second prize often. In 441, he suffered the same fate that Aeschylus had received at his hands, when he was defeated by the representative of the next generation, the third great Greek dramatist, Euripides. In contrast to Aeschylus and Euripides, Sophocles was active in politics during his lifetime and was even chosen to command the Athenian navy against Samos.

He wrote more than 100 plays, but it is less his profuseness than his power of dramatic creativeness which makes him so great. It is to him that the dramatic literature of all later time owes the tremendous innovation of introducing the third actor into the play. Before him, the Greek stage had known only the chorus and two actors. He reduced the importance of the chorus by making his words merely a commentary and so concentrating the actual dramatic action largely on the actors themselves. Another important innovation was that each of his tragedies was a unified work of art, independent in itself, while Aeschylus had always combined three tragedies into one unified series of plays, called trilogies, as in the "Oresteia." Besides introducing these developments in the formal architecture of the drama, Sophocles surpasses Aeschylus in that every action is carefully motivated, especially by the character of the acting person. With Aeschylus, the human being was the object of a monumental fate and was treated in a monumentally stylized manner. With Sophocles, the individual human character contributed to his fate. With Euripides, human beings became almost realistic in the modern sense. This same line of development can be observed in the three dramatists' treatment of the gods themselves. They are much more human, less inexorable, with Sophocles than with Aeschylus.

The beauty of Sophocles' language can be fully appreciated only by reading the original Greek text of his plays, although excellent translations are available. In this aspect of the drama also he represents the middle point, his language being less monumental than that of Aeschylus and not yet as smooth as that of Euripides.

Only seven of his plays are preserved: "Ajax," "Antigone," "Oedipus the King," "Oedipus at Colonus," "Electra," "The Trachiniae," and "Philoctetes." These same topics have provided the dramatists of the last 2,000 years with the elementary forms of human conflicts and developments. See also *Drama.*

Sorata (*sô-rä′tà*), or ILLAMPU, the highest mountain in Bolivia, situated about 16 m. E. of Lake Titicaca. It is an extinct volcano. The highest point is 21,495 ft. above sea level. Sir William M. Conway ascended it in 1897.

Sorbonne (*sôr-bŏn′*), a celebrated French college located in Paris. Though not formally opened until 1256, the college was founded three years earlier by Robert of Sorbon in the diocese of Reims. The Sorbonne received the sanction of Pope Clement IV in 1268. A *provisor*, selected by the university, headed the college, but administration actually remained in the hands of the *prior*, a member of the college elected annually. The two classes of members were divided into *Hospites* and *Socii*. The former were students only, taking no part in administrative affairs; the latter, 36 in number, conducted the business of the college. The Sorbonne taught theology only, being considered the foremost theological school of Europe. Its opinion was sought on many disputed points of doctrine. The Little Sorbonne (or Calvi) was established in 1271 to prepare students for attendance at the senior institution.

At about the beginning of the 16th century, the Sorbonne began to decline in influence, becoming more and more reactionary in thought. In 1621, the college was influential in effecting proclamation of an edict forbidding teaching which might be at variance with accepted thought.

New buildings were erected by Richelieu in 1627, but the entire Univ. of Paris was destroyed in 1792 during the French Revolution. The Sorbonne was revived when Napoleon reopened the Univ. of Paris (1808) and became the seat of the *Académie* of Paris, and three faculties of theology, science, and literature. New buildings replaced (1884-1900) those constructed by Richelieu and the faculty of theology was removed in 1885.

Sorbs (*sôrbz*), formerly a powerful Slavonic tribe in Germany. Descendants of the Sorbs now living in Lusatia (Lausitz) are called Wends by the Germans; they call themselves Sorbs, or Lužičane. They are today confined to about 1,300 sq. m. in the upper Spree Valley. Inasmuch as they are completely surrounded by Germans, they have become Germanized. Their language is called Sorbian and two dialects are spoken, Upper and Lower Sorbian. There are about 120,000 Sorbs, of whom about 50,000 are in Saxony and 70,000 in Prussia. Most of them are Lutheran, but about 12,000 are Roman Catholic.

Sorghum (*sôr'gŭm*), a plant which resembles broom corn and sugar cane. Several species are cultivated for the manufacture of a nutritious molasses, but in dry regions it is grown quite extensively for fodder. The sorghum plant is native to China, whence it was introduced into France, and in 1856 it was brought to America. The seed resembles that of broom corn. It is usually drilled in rows at the same time that corn is planted. The growth is slow for several weeks after coming out of the ground, but later it grows rapidly and usually attains a height of 8 to 16 ft. It is stripped of its leaves and cut before frost, usually in September or October. The stalks are pressed in a cane mill for the juice, which is reduced by boiling to molasses or sugar. An acre yields from 75 to 150 gallons of molasses or sorghum. The seed is highly valuable for its nutritive quality, but it is not used extensively as a food. Sorghum can be cultivated wherever corn grows, but also in more arid regions, where it is cut several times in the season as fodder for stock. The Kaffir corn of South Africa is a kind of sorghum. It has been acclimatized to America and is grown successfully for its seed and fodder from Saskatchewan to Texas.

SORGHUM PLANTS

Sorokin (*sôr-ō'kĭn*), PITIRIM ALEXANDROVITCH, sociologist, born Jan. 21, 1889, in Touria, Russia. He was educated at the Univ. of Petrograd. He served as *privatdozent* at the Psycho-Neurological Inst. (1914-16) and at the Univ. of St. Petersburg (1916-17). In that year he became editor of a newspaper, *The Free People,* a member of the executive committee of the All-Russian Peasant Soviet, a member of the Council of the Russian Republic and secretary to Alexander Kerensky, head of the Provisional Government. After Kerensky's government fell, however, Sorokin became a liberal anti-Bolshevist and returned to teaching. He was professor of sociology at the Univ. of Petrograd (1919-22). In 1922, he was forbidden by the Communist government to teach and was finally condemned to death and banished. He taught sociology at the Univ. of Minnesota from 1924-30 and at Harvard Univ. thereafter.

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THE SORBONNE

Sorokin believes that Western civilization cannot and should not continue without basic changes in its structure, since no further progress is possible under its present constitution. His numerous books include "Sociology of Revolution" (1925), "Social Mobility" (1927), "Contemporary Sociological Theories" (1928), "Principles of Rural-Urban Sociology" (1929), "A Source Book in Rural Sociology" (1930-31), "Social and Cultural Dynamics" (1937-41), "Time-Budgets of Human Behavior" (1939), "Crisis of Our Age" (1941), "Man and Society in Calamity" (1942), "Socio-cultural Causality, Time, Space" (1943), and "Russia and the United States" (1944).

Sorrel (*sŏr'ĕl*), a genus of perennial herbs of the buckwheat family. They are allied to the docks, from which they differ in their leaves and acid. The species common to America is the sheep sorrel, which is found in pastures and poor soil. The common sorrel of Europe has narrow leaves and grows to a height of from 1 to 2 ft. It is used in making soups, sauces, and salads. The *sorrel tree* of America belongs to the heath family and is native to the Appalachian Mts. of the South. It has white flowers and leaves about 5 in. long, which become crimson in early fall.

Sorrento (*sôr-rĕn'tō*), a city of Italy, located on the southeast side of the Bay of Naples, in the province of Naples, 17 m. S. by E. of the city of Naples. The city of Sorrento is picturesquely situated on a promontory overlooking the bay and has long been a noted tourist resort. Its trade includes Sorrento wines, olive oil, and fruits. The principal industries are the manufacture of silks and the making of parquetry. Dating back to Greek and Roman days, the city still contains remains of ancient temples; it also has a cathedral, a seminary and a monument to its native poet Tasso. It is an archiepiscopal see. During World War II it was the scene of bitter fighting between the Allies and retreating German forces. Population, *ca.* 7,000.

SOS (*ĕs-ō-ĕs*), international maritime distress signal transmitted by wireless; in Morse code, . . . — — — . . ., the letters were selected by the International Radio and Telegraph Conference, 1912, as a simplification of the many conflicting distress signals then in use. There is a common and erroneous belief that the letters stand for "Save Our Ship"; actually, however, the letters were chosen for no other reason than their simplicity. See also *Morse, Samuel F.*

Sothern (*sŭTH'ĕrn*), EDWARD ASKEW, actor, born in Liverpool, England, Apr. 1, 1830; died in London, Jan. 31, 1881. His parents wished him to study for the church, but he preferred a theatrical career, playing with varied success in different parts of Great Britain. On his first visit to America, in 1852, he was not highly successful, but in 1858 he played the role of *Lord Dundreary* in "Our American Cousin" and met with distinguished success.

Sothern, EDWARD HUGH, actor, son of the above. born in New Orleans, La., Dec. 6, 1859; died Oct. 28, 1933. He first appeared in 1876, playing successfully at the Abbey Theater in New York, and later played with John McCullough and John T. Raymond. His chief roles were in "One of Our Girls," "An Enemy to the King," "The Prisoner of Zenda," "Lord Chumley," and "Captain Letterblair." In 1904 he joined Julia Marlowe in touring Canada and the U.S. He is remembered as one of the most successful actors of America.

Soul (*sōl*), the innate quality of man which makes him an individual feeling and thinking human being, which distinguishes him from lower animals, which in its very essence is spiritual and not physical. Soul has, however, to be distinguished from mind and reason, from conscience and free will, which are capacities and qualities. Spirit, on the other hand, is too vague an expression to be identical with soul, especially since it is applied also to beings which are not human. See also *Spiritualism.*

Regardless of whether we believe in the existence of a soul or not, we must define it even more exactly as being an immaterial unit, which includes the phenomena of consciousness, of reaction, of willing, of feeling, and of imagining. The soul is the carrier or medium of these phenomena as a physical thing is the carrier of physical, chemical, or biological phenomena. If and when certain of these qualities are attributed to animals and plants, to fountains or the ocean, we have to speak of them as having souls also, as in primitive mythologies, in fetishism and totemism, in spiritualism, and in the poetry of almost all people. From a scientific point of view, this attribution can, of course, not be recognized.

The existence of the soul cannot be proved, since in its very essence it is immaterial and, therefore, can never be an object of sensual experience, *i.e.,* of sensation through the senses. Internal experience, however, may prove it. The history of philosophy tells of the internal fight for or against the concept of a soul. Greek philosophy believed generally in its existence, but had, peculiarly, a very physical idea of it and did not agree upon its immateriality. Some Greek philosophers believed that it was something like air, others something like fire, others again something composed of subtle atoms (irreducible elements of finite spatial or temporal span). Plato and Aristotle considered it as a complex of inseparable (Plato) or separable (Aristotle) elements.

Christian theology, from its very beginning, believed in the soul as a unified spiritual substance united with the body. A diversity of opinion ruled only in the question of whether it derived from the souls of the parents or whether each individual soul was each time individually created by God. The latter concept was generally accepted during the Middle Ages. The form of the union with the body was explained by the various theologians in various ways. Finally St. Thomas Aquinas, modifying some Aristotelian concepts, held that the soul was not added to the body but that it represented the very essence of the body, the only source of all its vital and mental performances. Later Scholastics did not completely agree with him.

Since the soul is a simple spiritual unit, it has to be immortal; man, however, represents an amalgamation of soul and body and is, therefore, also bound to matter. Beyond this difference, the Augustinian concept of the simple, immaterial, and spiritual nature of the human soul was always kept. See *Augustine, St.*

After the Middle Ages, especially since Descartes (*q.v.*), the main controversy has been between those philosophers who believed that the soul was a simple spiritual unit combined with the body during the life of the individual, and the materialists, who believed that the soul simply represented a combination of chemical and physical reactions and, therefore, died with the body, the material bearer of its substance. Various materialistic philosophers believe that all psychological phenomena can be explained as functions of the brain. Other materialists emphasize that the content of imagination, direction of volition, and many other allegedly psychological phenomena are actually only mechanical reflexes (mechanism) and that, therefore, the hypothesis of a soul is unnecessary.

The materialists gained during the period of the Enlightenment in the 18th century and through the materialist period of the 19th century. Since the time of Kant (1724-1804), however, there has existed still a third school, the German idealistic philosophers, who believe that not the soul but the ego is the vessel of all these phenomena, and that soul and ego need not be identified. They neglected completely, however, the fact that the ego, the alleged unit of all phenomena of consciousness, is in itself just a phenomenon of consciousness, literally *self*-consciousness.

Independent of all these various philosophical schools, the theological systems of all religions deal with the soul also. For their followers, no logical proof of the existence of the human soul is necessary; they take it as a matter of fact. Their problem is not the existence of the soul but its quality, its survival after death, transmigration, etc. See *Brahmanism; Buddhism; Christianity; Judaism; Mohammedanism; Zoroastrianism*, etc.

Soule (*sōl*), GEORGE HENRY, JR., writer and editor, born June 11, 1887, in Stamford, Conn. Educated at Yale Univ., he joined the staff of the liberal weekly, *The New Republic*, in 1914, remaining with it until 1946, and serving as editor after 1924. In 1946, he became president of a newly established publishing house, Pilot Press. His books include "The Useful Art of Economics" (1929), "A Planned Society" (1932), "The Coming American Revolution" (1934), "The Strength of Nations" (1942), "America's Stake in Britain's Future" (1945), and others.

Soult (*sōōlt*), NICOLAS JEAN DE DIEU, Marshal of France, born at St.-Amans-Bastide, France, Mar. 29, 1769; died Nov. 26, 1851. Enlisting as a private in 1785, he rose to the rank of general by 1799. Napoleon made him a Marshal of France in 1804. He won victories over Sir John Moore and Wellington. He was obliged to surrender at Toulouse in 1814. He declared himself a royalist after the first abdication of Napoleon. When Napoleon returned from Elba, in 1815, Soult again became a Bonapartist and served as major general at Waterloo. The royalists banished him after the fall of Napoleon, but he was recalled in 1819, and in 1820 was again made Marshal of France. He supported Louis Philippe after the Revolution of 1830, served as minister of war (1830-34 and 1840-44), and retired in 1847.

Sound (*sound*), subjectively, the physiological sensation produced in the ear by vibrations in an elastic medium, such as air; objectively, the mechanical vibrations in an elastic medium capable of producing the sensation. Objective sound results when the medium in which the sound occurs is successively compressed and rarefied, giving rise to mechanical vibrations. When these compressions and rarefactions of the medium reach the tympanic membrane of the ear (eardrum), the vibrations are transmitted through the mechanical system of the middle ear to the fluid in the inner ear. (See *Ear.*) The fluid of the inner ear carries the vibrations to the auditory nerve, which transmits impulses to the brain, which takes cognizance of the sensation.

Sounds may be generated by mechanically vibrating an elastic medium, gaseous, liquid, or solid. Examples of this are striking a steel bell, plucking a violin string, and blowing across the vocal cords. It may be noted that a vacuum, since it contains no elastic medium, will not transmit sound. The velocity with which the sound travels within any given medium is determined by the elasticity, density, and temperature of the medium. In air, at 32° F., sound travels at 1,088 ft. per second, and in water at ordinary temperatures, sound travels approximately 4,700 ft. per second. In solids the velocity of sound ranges up to 16 times the velocity in air. The velocity of sound in any medium will increase with an increase in temperature. However, at a given temperature sounds of all frequencies travel at the same speed in a given medium. If the medium is in motion, its velocity will add to that of the sound, so that sound travels faster with the wind than against it relative to the ground. A second physical property of sound is its frequency, which is often described as tone or pitch. The frequency of sound is the number of successive compressions and rarefactions occurring per second. One compression and one rarefaction together are called one cycle. The average range of frequencies which the human ear can hear is from 16 to 16,000 cycles per second. Below 16 cycles per second the average person hears each pulse separately while any sound above 16,000 cycles per second, if it can be heard at all, is painful to the average human listener. (Scientists have recorded the hearing of sounds having frequencies up to 25,000 cycles per second, but only under carefully controlled laboratory conditions.) At a given frequency the distance between successive compressions or rarefactions of a given medium constitute the wave length of the sound in that medium. In air the wave length of a 20-cycle note is about 56 ft., while the wave length for a 20,000-cycle note is approximately ⅝ in.

The frequency range of the fundamental tone of various musical instruments extends from 16 cycles per second to about 5,000 cycles per second. However, musical instruments produce, besides the fundamental, a number of related tones of higher frequency, known as harmonics or overtones. Some of these overtones have frequencies as high as 40,000 cycles per second.

A fourth physical property of sound is its intensity. Sound intensity is commonly measured in *decibels,* abbreviated *db.* The decibel is actually the expression of a ratio of two sound intensities. (Mathematically expressed:

$$db = 10 \log_{10} \frac{I_1}{I_2},$$

where I_1 and I_2 are the two intensities being compared.) For every increase of 10 db there is a tenfold increase in intensity; so for every 60 db there is a millionfold increase in intensity. Doubling the power causes an increase of 6 db, while the smallest perceptible change which the ear can detect is 2 db.

To establish an absolute scale of sound intensity, acoustical engineers have chosen the smallest audible sound, the threshold of hearing, of a 1,000-cycle-per-second note as the zero on the decibel scale. This sound has an intensity of 10^{-16} watts per sq. cm., or about one one-millionth the intensity of average speech sounds. The intensity of sound diminishes in an inverse proportion to its distance from the source. Sounds in an elastic medium may have intensities varying from nothing to a maximum level which is determined by the compliance of the medium; therefore in air the loudest sound will have an intensity of approximately 1,000 watts per sq. cm., or 194 decibels. However, the ear can hear but a limited range of intensity, from about 0 db to approximately 120 db. Sounds below this range are inaudible and above this range painful. Continued exposure to sounds of this intensity or higher cause permanent damage to the ear.

Sound may go from source to observer by a direct path, reflection, refraction, or diffraction. Reflected sounds may produce echoes, while refraction and diffraction of sounds will carry them around objects interposed in the path between source and observer.

Musical sounds are those in which certain harmonics or overtones of a given fundamental tone are present at various intensities. Noise is produced when sounds of unrelated frequency are produced, such as by the striking of several piano keys simultaneously; or noise may be generated when the successive compressions and rarefactions are of different, random frequencies, such as the jangling of keys or the sound of applause.

SOUND ENERGY. Work or energy is required to produce sound, and sound itself is a form of energy. Plucking a string or striking a bell is performing work on the string or bell. The sound generated does work moving the medium through which it travels. If an object such as a wineglass stem has a length bearing a certain relationship (an integral multiple of a half wave length) to the wave length of a very loud sound, it will vibrate sympathetically with that sound (resonate). When the sound is very loud, its energy content is high, and if the glass stem resonates, it may break. In the range of frequencies above audibility, high-intensity sound has sufficient energy to set fire to absorbent cotton, and to kill or deform insects after a few seconds of exposure. In both the audible and inaudible ranges a high energy content can cause temporary or permanent damage to the ear.

During World War II, sound was used underwater by ships and submarines (see *Sonar*) to locate other ships and objects and to guide torpedoes, in a manner similar to radar (q.v.). Sound, in earth and in air, with the aid of trigonometry, was used to locate the position of enemy artillery, and similarly in peacetime it is being used in geophysics to map the earth hundreds of feet below the surface, and to locate oil-bearing strata. See also *Echo.*

Sound, THE, OR ORE SUND, a strait of Europe, lying north of Germany. It connects the Kattegat with the Baltic Sea and separates Sweden from Denmark. About 50 m. long, it is an important waterway. Denmark collected toll from all merchant vessels passing The Sound from the 15th century until 1857. At that time the duties were abolished by an indemnity to Denmark amounting to $16,000,000; the same treaty stipulated that the subscribing nations must maintain lighthouses on its coasts.

Sounding (*sound'ĭng*), the process of measuring the depth of water and nature of the sea bottom. Soundings were originally made by means of a plummet—a lead weight attached to a rope. A tallow or grease coating was applied to the end of the plummet, to which gravel, shells, sand, and other particles might adhere when the bottom was reached. Obviously, the deeper the water, the heavier the weight must be in order to "feel" on reaching bottom.

The first approximately accurate soundings in deep water were made with a light line and a heavy weight. When the rate at which the line ran out decreased suddenly, the bottom was known to be reached. The line was then cut at the surface and the depth obtained by measuring the remainder. The next development, *ca.* 1850 (by U.S. Navy Midshipman J. M. Brooke), had the sounding tube arranged to pass through a hole in a cannon ball. The latter dropped off when bottom was reached, allowing easy recovery of the light line. Such an instrument was used by the British *Challenger* expedition (1872-75), the first systematic attempt to outline the main contours and the ocean basins. In 1880 Lt. Comdrs. Havell and Sigsbee, U.S.N., modified a sounding machine, originally invented by Lord Kelvin, which used piano wire instead of hemp line. The new technique was first used successfully on the U.S. Coast and Geodetic Survey steamer *Blake*. The piano wire, with a weight which dropped off on striking bottom, allowed much faster and more accurate work due to reduced friction with the water as compared with the much-larger-diameter hemp line.

Modern echo sounding came into use after World War I. In this system a sound impulse is directed downward from the ship's hull; the echo from the bottom is then picked up and amplified so that its travel time can be read off in terms of depth. Models now available use sound at supersonic frequencies, feeding the return echo to automatic recording devices which give a continuous record of depth on a tape. Several millions of miles have already been recorded and show that the old individual soundings completely missed the significant details of the topography. These records are available for new charts and for scientific study. Using such sound gear, and with improved location of the surveying ship by electronic systems, large areas of the continental shelf of the U.S. have been charted with an accuracy approaching that of many maps of the dry land. With such a chart, it is possible for a ship equipped with echo sounding gear to locate itself by comparing the profile of the bottom over which it is passing.

In most parts of the deep oceans, knowledge of bottom topography is the direct result of the scientific investigations of university and private research organizations.

As stated above, many of the earlier hemp rope or wire sounding machines brought up a sample of the bottom—either in a short tube or by tallow on the bottom of the lead. As geological interest increased, various devices were developed to obtain better samples. For the coarser bottoms there are now available clamshell and orange-peel buckets, samplers which penetrate to a uniform depth each time and are returned closed to the surface, and even dredges which break off portions of exposed bedrock in the undersea canyons. For finer bottom sediments, weighted core tubes bring up sections of the bottom. By this method, many cores 30 to 100 ft. long have been recovered.

The mean depth of all the oceans is 12,000 ft. The greatest recorded depth in the Atlantic is 27,240 ft. off Puerto Rico and in the Pacific, 34,465 ft., off the Philippine Islands. See also *Ocean.*

Sousa (*s͞oosa̮*), JOHN PHILIP, band leader and composer, born in Washington, D.C., Nov. 6, 1854; died in Reading, Pa., March 6, 1932. He showed talent for music early in life, being noted as a conductor in theater orchestras while still a boy. In 1876 he was a violinist in Jacques Offenbach's orchestra during its American tour. For 12 years (1880-92), he was conductor of the U.S. Marine Band. In 1892, with the help of friends, he organized Sousa's Band, with which he toured the U.S. and other countries and which ultimately gained him the title of the "March King."

JOHN P. SOUSA

Among his popular marches, still played today, are *"Semper Fidelis"* (1888), "The Washington Post" (1889), "Liberty Bell" (1893), "Stars and Stripes Forever" (1897), and "Hands Across the Sea" (1899). He also write light operas and a biography, "Marching Along" (1928).

South (*south*), ROBERT, Anglican preacher, born in Hackney, England, in 1634(?); died in London, July 8, 1716. Educated at Oxford, he took orders in the Church of England (1658), and was appointed chaplain to the Duke of York and others, finally becoming rector of Islip, Oxfordshire (1678). An excellent pulpit orator, he vigorously opposed the Catholics as well as the Puritans. He is noted for his controversey on the Trinity with William Sherlock, dean of St. Paul's in London. South attacked the dean by publishing "Animadversions on Dr. Sherlock's Book, entitled A Vindication of the Holy and Ever Blessed Trinity"; then he answered Sherlock's "Defense" by writing "Tritheism Charged

Upon Dr. Sherlock's New Notion of the Trinity, and the Charge Made Good."

South Africa, REPUBLIC OF, a country of Africa, situated at the southern end of the continent. It is bounded on the N. by South-West Africa, Bechuanaland, and Southern Rhodesia; on the E. by Mozambique, Swaziland, and the Indian Ocean; and on the S. and W. by the Atlantic Ocean. With an area of 472,359 sq. m., the republic is *ca.* twice the size of Texas. It comprises four provinces: Cape of Good Hope, Natal, Orange Free State, and Transvaal (*qq.v.*). South-West Africa has been a League of Nations mandate to South Africa since World War I; it is, however, administered as an integral part of the republic. Walvis Bay is a territory, although situated in and administered by South-West Africa. Prince Edward and Marion islands, *ca.* 1,200 m. S.E. of Cape Town, are possessions.

DESCRIPTION: A narrow, fertile coastal belt gives way to the semiarid Karroo tablelands. These rise, in turn, to the High Veld, a plateau 4,000 ft. to 6,000 ft. high, which makes up much of South Africa. Of several escarpments, the highest is the 11,000-ft. Drakensberg Range, in which is the country's highest mountain, Mont aux Sources (10,769 ft.). Because of the configuration of the land, none of the rivers is wholly navigable—not even the sizable Orange and Limpopo rivers.

CLIMATE: The eastern coast at Natal has warm winters but muggy summers, while on the southern coast winters are mild and summers cool. The Cape Town area has a Mediterranean climate. The cooler interior (median temperature, *ca.* 60° F.) has dry, mild winters and rainy, warm summers. In general, the rainfall decreases as it moves west from the Indian Ocean and is so unpredictable that droughts and floods occur frequently. The Kalahari Desert is a result of the arid influence of the cold Benguela Current along the west coast.

FLORA AND FAUNA: Forests cover the moist eastern slopes of the uplands in Natal and Cape Province. Short and tall grasses cover the High Veld. In southwest Cape Province is a chapparal-like bush vegetation. Thorny scrub marks the desert. Native animals, best seen in the Transvaal's Kruger National Park, include the antelope, elephant, giraffe, hippopotamus, lion, rhinoceros, and wild buffalo. Cape Province has ostrich farms.

AGRICULTURE: The chief crops are barley, cotton, kaffir corn (sorghum), and mealies (maize or millet, the diet staple, of which 9,500,000,000 lb. are grown annually). Citrus fruits and wheat are raised in irrigated valleys. Natal has sugar-cane plantations, and wine grapes thrive on the southwestern coast. Wool, the leading agricultural product and export, is obtained from more than 37,000,000 head of sheep, whose annual clip is *ca.* 315,000,000 lb. Wool sales in recent years have exceeded 290,000,000 lb., worth more than $140,000,000.

MINING: South Africa is rich in diamonds, gold, and uranium. In 1960 the Kimberley mine and others produced 3,141,463 carats of rough diamonds; 2,997,861 carats were sold for $47,393,000. Over 66 per cent of the free world's gold comes from South Africa, chiefly from the Rand in the Transvaal and from the Orange Free State. In 1961 the mines produced 22,946,294 fine oz., worth $803,120,000. The 1960 atomic-material export, chiefly uranium, was valued at $137,000,000. Other minerals are coal (41,000,000 tons mined annually), copper, lime and limestone, iron, manganese, chrome, and asbestos. In 1960 the total value of mineral production was $1,191,424,000.

TRANSPORTATION AND COMMERCE: The South African Railways and Harbours Admin. operates 14,000 m. of railroads and the South African Airways (which provides European and African connections), and controls the ports (Durban, Cape Town, Port Elizabeth, and East London). Of the total of 200,000 m. of roads, 5,000 m. are national highways.

The principal export-import products are metals, metal manufactures, machinery, and vehicles. Gold, wool, and foodstuffs (canned fruit, fish, wine) are the leading exports, followed by uranium and diamonds. Other chief imports are fibers, yarns, textiles, and apparel, as well as automobiles and parts, drugs and fertilizers, and motor fuels. Total exports in 1962 exceeded $1,332,000,000 (excluding gold, valued at $850,000,000); imports totaled *ca.* $1,435,000,000. Trade is conducted mostly with Great Britain, the Commonwealth countries, the U.S., and West Germany.

MANUFACTURING: Until World War II South Africa was primarily agricultural; since 1945 industrial expansion has been such that the gross industrial production in 1960 contributed $3,885,000,000 to the gross national product of $6,267,800,000; thus, industry produced more than half the combined total of agriculture and mining. One-third of the industrial output is from southern Transvaal, where half the metalworking and engineering plants are located. Government-operated steel works at Pretoria and Vereeniging have an annual capacity of 2,350,000 ingot tons and supply *ca.* 90 per cent of the country's steel needs. Johannesburg, the largest city, is also the industrial, financial, and gold- and diamond-mining center. Food processing, the largest manufacturing industry, is centered in the Transvaal (canned vegetables) and Cape Town (canned fruit). Port Elizabeth produces automobiles; and major chemical, paper, pulp, and paint industries are at Durban. The Bantu comprise half the unskilled labor force in manufacturing and four-fifths of that in construction. Unskilled white labor fluctuates, but skilled whites are in such short supply that some Bantu now hold high-paying skilled and semiskilled jobs.

Population: In 1960 South Africa had a population of 15,841,128. The white "European" minority totaled 3,067,638, of whom 60 per cent spoke Afrikaans and 40 per cent spoke English, the two official languages. There were 12,773,490 nonwhites. Of these, 10,807,809 were members of the seven main Bantu nations; 477,414 were Asiatics, mostly Indians living in Durban; and 1,488,267 were coloreds—persons of mixed blood, most of whom live in Cape Province, where they are called "Cape Coloured."

Protestant churches, notably the Dutch reformed, are widely attended. Other denominations include Methodist (leading church of the nonwhites), Anglican, Roman Catholic, Presbyterian, and native Separatist churches. Of the nonwhite population, 45 per cent is pagan.

THE REPUBLIC OF SOUTH AFRICA

Province	Capital	Area (in sq. m.)	Population (1960) in thousands White	Population (1960) in thousands Nonwhite
Cape of Good Hope[1]	Cape Town	278,465	997	4,311
Natal	Pietermaritzburg	33,578	340	2,593
Orange Free State	Bloemfontein	49,866	275	1,099
Transvaal	Pretoria	110,450	1,455	4,770
	Total	472,359	3,067	12,773

[1] Not including Walvis Bay, 374 sq. m.

Education: Most public primary and secondary education is under provincial control. The republic administers all Bantu education, including three university colleges for undergraduates. There are nine universities for whites, of which the largest is the Univ. of South Africa, in Pretoria. Cape Coloureds also have a university college. Except for agricultural schools, which are province-controlled, the republic operates all technical and vocational schools.

Government: The constitution provides for a president, who is elected to a seven-year term by both houses of parliament, the senate and the house of assembly. Of the 54 senators, 11 are nominated by the president and 43 are popularly elected. All must be white, but nominees are expected to serve the interests of all nonwhites. The Bantu maintain their own tribal, regional, and territorial authorities. The assembly has 160 directly elected white members, including four representing the Cape Coloureds, who vote separately from the whites. South-West Africa is represented by six assemblymen and four senators. Whites over 18 may vote. Pretoria is the seat of government, but the legislature meets in Cape Town.

History: The Portuguese navigator Bartholomew Diaz discovered the Cape of Good Hope in 1488, but no settlement was made until 1652, when the Dutch East India Co. made the cape a supply station for ships in the eastern trade. Farms were established by about 2,500 Dutch, German, and French Huguenot settlers, but the colony's growth slowed in the 1770's when Bantu tribesmen were encountered on the southwest coast. In 1795 the British captured the cape and its 16,000 Europeans, and in 1814 Great Britain purchased the colony from Holland under terms of the Treaty of Vienna.

The Boers (*q.v.*) resented British rule for various reasons. Under colonial policy, which denied them the use of the Afrikaans language in the courts and the schools, they saw a loss of their national identity. They were also influenced by the economic hardship resulting from the abolition of slavery in 1834. In addition, marauding Bantu were being appeased at the expense of frontier inhabitants. Between 1836 and 1840 about 7,000 Boers quit the colony. Families packed their household goods in ox wagons and, driving herds of sheep and cattle alongside, made "the Great Trek" northward to Free State and Vaal. Some conquered the Zulus in Natal and in 1838 established a Boer republic, but in 1843 Great Britain annexed Natal. At the Sand River Convention (1852), the British recognized the Transvaal as an independent Boer republic. The Orange Free State was given independence at the Bloemfontein Convention (1854). In that year also, the first Cape Parliament was held. In 1877 England annexed the Transvaal; but in 1880 a war of independence broke out and in 1881 self-government, subject to British suzerainty, was restored. Though even this restriction was virtually removed in 1884, S. J. P. Kruger (*q.v.*), president of the Transvaal, remained implacably anti-British. The name South African Republic, adopted originally in 1853, was resumed. Discovery of diamonds (1867) and gold (1870) intensified the differences between the British and the Boers, who were in the majority among whites. In 1871 Great Britain annexed Griqualand West, a region of the Orange Free State which included major diamond fields near Hopetown and Kimberley. The opening of the Witwatersrand goldfield in the Transvaal in 1886 brought an influx of European immigrants (*uitlanders*); by 1895 there were some 50,000 of these "foreigners," 21,000 of whom were English.

The *uitlanders* soon became restive. They formed the majority of the Transvaal population, owned one-third of the land and nine-tenths of the property, and paid three-fourths of the taxes; yet they had no political rights since they were not permitted immediate citizenship by the Kruger government. In 1895 Cecil J. Rhodes (*q.v.*), prime minister of Cape Colony, encouraged revolt by the *uitlanders* and instigated the abortive Jameson Raid on Johannesburg (see also *Jameson, Leander S.*). Although unsuccessful, this armed invasion served to unite the Boer republics; it destroyed the Dutch-British alliance in Cape Colony and intensified Kruger's desire to unite South Africa under a Dutch republican flag. Similarly, Rhodes had long hoped for a South African confederation like that of the Dominion of Canada. *Uitlander* grievances were discussed between the Transvaal and Great Britain in 1899, but when the negotiations collapsed, the British massed 22,000 troops on the borders of the Transvaal. On Oct. 11, 1899, the Boer republics declared that a state of war existed with Great Britain (see *Boer War*). After British victory in 1902, the Transvaal and the Orange Free State were governed as British crown colonies until 1907, when self-government was restored. By late 1908 a constitutional convention was working toward formation of the Union of South Africa (*q.v.*), which endured as a monarchical form of government from 1910 until 1961.

In October 1960, in a referendum among 1,800,000 white voters, a majority of 74,500 chose the republican form of government, and on May 31, 1961, the Republic of South Africa was inaugurated. At the same time the republic withdrew from the Commonwealth, as a result of objections by others members to its racial policy of apartheid (total separation of the races), which had been given full political effect since 1948. The majority Nationalist party, supported by the Afrikaners (Boers), views this policy as taking cognizance of the "multinational," rather than "multiracial," character of the country, and aims at the partitioning of South Africa into separate states for the whites and the several Bantu nations, while permitting economic interdependence among them. The United party, voice of most English-speaking white South Africans, supports the cultural, political, and social aspects of apartheid but not its basic objective of separate constitutional development for the nonwhites.

South Africa, UNION OF. See *Union of South Africa.*

South America, the smaller of the two continents that form the Western Hemisphere. Of the six continents of the world, it is fourth in size, being exceeded in extent by Asia, Africa, and North America. It is located between 12° 45′ N. latitude, and 55° 30′ S. latitude, and between 81° 30′ W. longitude and 35° W. longitude. The continent is triangular in shape and extends 4,800 m. from Point Gallinas in the north to Cape Horn in the south. The greatest breadth is 3,300 m., which occurs at 6° S. lat., roughly between Paita, Peru, on the west and João Pessóa, Brazil, on the east. The total area of the continent of South America is 7,033,003 sq. m.

Photo by B. Holmes, courtesy Ewing Galloway, N. Y.

CHRIST OF THE ANDES

This statue, erected in 1892, commemorates the settlement of a boundary dispute between Argentina and Chile

The continent is bounded on the N. by the Caribbean Sea, on the N.E. by the North Atlantic Ocean, on the E. by the South Atlantic Ocean, on the S. by the Drake Straits of the Antarctic Ocean, on the W. by the South Pacific Ocean, on the N.W. by the North Pacific Ocean and the Isthmus of Panama, which connects South America with Central America.

The Equator crosses the northern part of the continent, just north of the Amazon River.

DESCRIPTION. The coasts of South America are smoother and much less indented than those of North America; however, there are several prominent indentations such as the Gulf and Lagoon of Maracaibo on the north, the mouths of the Orinoco, Amazon, and Plata Rivers on the east, and the Gulf of Guayaquil on the west. On both the northern and southern coasts there are groups of islands associated with the mainland. Off the north coast lie the British island of Trinidad and the Dutch West Indies, including Bonaire, Curaçao, and Aruba. The southern tip of South America is made up of a series of islands grouped around the major island of Tierra del Fuego, which is separated from the mainland by the Straits of Magellan. The famous Cape Horn is on an island south of Tierra del Fuego. Approximately 500 m. E. of the Straits of Magellan are the British-owned Falkland Islands. The whole southwestern coast of South America from about 42° s. latitude is formed by the Chonos Archipelago, a series of small barrier islands similar to the Alexander Archipelago of southeastern Alaska.

The physical features of South America are extremely diversified. The major mountain chain is the Andean Cordillera and there are three highland regions, the Guiana and Venezuelan Highlands, the Brazilian Highlands, and the Plateau of Patagonia. The Andes are one of the greatest mountain chains in the world, extending from extreme northern to extreme southern South America, paralleling the west coast from 20 m. to 100 m. inland. These mountains are high, steep, and narrow, averaging about 200 m. in width except in Bolivia where they are about 400 m. wide. The peaks reach altitudes from 18,000 to almost 23,000 ft.; the greatest altitudes are attained in the vicinity of 32° s. latitude. Mt. Aconcagua, on the Argentina-Chile frontier, 22,835 ft. in elevation, is the highest mountain in the Western Hemisphere. Some of the other high peaks of the Andes are: Cacaca, 20,250 ft.; Cotopaxi, 19,613 ft.; Chimborazo, 20,498 ft., and Antisana, 19,335 ft.

The geological structure of these mountains is complex. The Andes were formed by folding, faulting, and volcanism. There are about 40 active volcanoes and many inactive ones in the mountain chain. The Andes are not an extension of the Rocky Mts., nor are they a complete or single chain; they are formed by several associated mountain units. The Andes act as a great barrier stretching across all of western South America.

In eastern South America from Venezuela to Uruguay is an almost continuous highland region. Generally speaking, these highlands are formed by a base of hard crystalline rock, covered by either stratified sedimentary rock or lava. The general elevation of the highlands is between 2,000 and 2,500 ft., but there are some elevations and mountains as high as 9,000 ft. A large portion of the surface of the Brazilian Highlands is level, but rivers have cut great canyons through the plateau surface and there are many rapids and waterfalls. The highest waterfall in the world is in the Guiana Highlands—the Kukenaam Falls of British Guiana, with a fall of 2,000 ft. The Plateau of Patagonia is a tableland with erosion-resisting granite peaks standing up above the general level.

The major plain areas of South America are largely river plains. In the extreme northwest there is the plain of the Cauca and Magdalena Rivers and the lowland of the Maracaibo Basin of Venezuela. Also in Venezuela is the plain of the Orinoco River. Northern Brazil is made up of the plains of the Amazon. Paraguay, Uruguay, and southwestern Bolivia and northeastern Argentina are formed by the plains associated with the rivers tributary to the Plata, such as the Pilcomayo, the Paraguay, the Paraná, and the Uruguay. All of the major rivers of South America drain into the Atlantic Ocean. The Amazon River system, the largest in the world, is 3,500 m. long and discharges more water than the Mississippi and Missouri Rivers combined.

Like the surface, the climate of South America is extremely diversified, though it is, generally speaking, more equable than the climate of North America. The reason for the many different climatic types is the fact that South America extends through so many degrees of latitude that it is in the Tropical, Subtropical, and Temperate Zones. The climate is influenced by the northeast and southeast trade winds and the southern hemisphere westerly winds. The location and elevation of the mountains and highlands and the relation between land and water also influence the climate.

The northwest coast of South America has a hot, wet climate with no cool season. From about 6° to 30° s. latitude, the west coast of South America is one of the driest regions of the world. South of this dry region, particularly in the area of Santiago, is a delightful Mediterranean climate, with short, rainy winters and long, dry, warm summers. The extreme southern tip is cool, wet, and windy. The Andes Mts. have a cool to cold climate, depending upon elevation. The northern coast of South America is a warm, semi-arid district. The Guiana coast and the Amazon basin has a year-round high temperature and a rainfall of over 80 in. a year. Most of the rest of northern and central South America has a warm temperature, with 40 to 80 in. of rainfall a year, and a distinct dry period during the year. Southern South America has cool, moderate temperatures with the rainfall decreasing from 40 in. in the northeast to less than 10 in. in the southwest.

FLORA. Because of the diversified physical conditions, the vegetation of South America varies considerably from one section of the continent to another. The west coast deserts are practically barren, while the humid southwestern coast is covered with dense evergreen forests. Most of the high Andes have an alpine fauna. In northern South America there is xerophytic scrub vegetation and tropical scrub forest. The Guiana coast and the Amazon basin have the most extensive equatorial forests in the world, known as the selvas. The Brazilian Highlands and the Grand Chaco have a tropical scrub forest, and extreme southern Brazil has an unusually interesting Araucaria pine forest.

There are several large tropical grassland areas: llanos in the Orinoco River valley, the Campos of central Brazil, and the temperate grasslands or pampas in the southeastern section of South America from Uruguay southward to Patagonia.

Among the plants which are native to the continent are the so-called Irish potato, tree ferns, deciduous trees, several species of pampas grass, many palms and bamboos, and a large number of coniferae.

Fauna. The animal life of South America may be said to include that of the West Indies and Central America. Since many forms are isolated and materially different from those of North America, it is believed that the two continents were formerly separated and that they were united at a comparatively recent date. Eight families of mammals belong exclusively to this continent, including several species of rodents, many edentates, the blood-sucking bats, and two families of monkeys. It has no ruminants, except the llamas, few insectivora, only one kind of bear, and no animals related to the horse, except one species of tapir. The birds include 23 families and 600 genera, many of which belong exclusively to the continent. The reptiles include the boas, the scytales, and several families of lizards and frogs. The birds of song and plumage are well represented, including the humming bird, the tanager, the flamingo, the toucan, the parrot, and the araçari. A large number of sea fowl and birds of prey belong to the continent, the latter including the condor, which is the largest bird of this class. An abundance of fish is found in the fresh waters as well as off the shores.

Minerals. The continent is rich in many kinds of minerals, especially in gold, silver, diamonds, copper, tin, iron, lead, borax, niter, mercury, and oil. However, mineral extraction has been confined chiefly to the production of gold, silver, and oil. Gold occurs in the interior of Brazil, in southern Argentina, and throughout the greater part of the Andes. Tin, copper, and silver are obtained in large quantities in Bolivia and other sections of the western highlands. Copper and mercury are mined in the Andes and on the northern coast. Iron deposits are known to exist in the three principal mountain systems, but this metal has not been produced extensively. Formerly, Brazil was the principal source of diamonds, but the output is greatly surpassed by that of South Africa. Rich guano deposits are worked along the coasts of Chile and Peru, niter and borax are obtained in Chile, and coal is found in Brazil, Uruguay, Argentina, and Colombia. Venezuela is the principal source of emeralds, oil, and asphalt. There may be some uranium in South America. As compared with Mexico, Canada, and the U.S., the mining interests are not well developed.

Industries. Agriculture and stock raising continue to be the leading industries. Wheat is grown extensively enough in Argentina and Chile to allow these countries to compete with Canada and the U.S. Coffee is grown in large quantities in Brazil, which continues to be the chief source of this product. Brazil, the Guianas, and Venezuela have a large output of sugar and tobacco. Cacao is grown in the valley of the Amazon and Orinoco, corn is cultivated more or less throughout the tropical regions, and fruits and vegetables are abundant, except in the extremely southern part. Bolivia, Peru, Colombia, and the valley of the Amazon produce large quantities of rubber and medicinal plants. Grazing is the principal industry in a large part of the valley of the Paraná, especially in southern Brazil, Uruguay, and large parts of Argentina. Cattle are bred extensively in the llanos of Colombia and Venezuela.

Manufacturing has not been developed as extensively as the resources would justify. Comparatively little has been done in the production of steel and iron. Although lumber is produced in large quantities, it is exported chiefly in a semimanufactured state. Home manufactures, such as weaving, furniture making, etc., are common. Argentina, Chile, Brazil, and Peru have a considerable railroad mileage in operation. Several transcontinental lines connect the Atlantic with the Pacific, but they are confined to the valley of the Plata River. Airplane transportation is being developed. A large part of the trade is carried on the rivers, many of which are navigable for long distances; but the Amazon, the La Plata, and the Orinoco are the most important in this respect. A large part of the interior trade is carried by mules and ponies. Oxen are employed extensively for farm work. The exports consist principally of coffee, wheat, rubber, cotton, silk, borax, silver, lumber, meat, hides, tobacco, and medicinal plants.

Inhabitants. South America was peopled by many tribes of Indians before the continent was discovered and settled by Europeans. Some of these inhabitants were powerful nations, such as the Araucanians of northern Chile, the Yahgans and Onas of the southern tip of South America, the Incas of Peru, the Caribs of the northern coast of the Amazon, and the Arawaks of the Orinoco. Some nations, such as the Incas, had large cities and complex civilizations, while others consisted merely of wandering tribes. The Araucanians were among the chief aborigines. They and kindred races occupied a large part of the highlands in the northwestern part of the continent, extending southward to Patagonia. They carried on agriculture, constructed canals and aqueducts, and maintained schools and other institutions common to an intelligent people. These peoples were either killed or enslaved, or became intermixed with the Spanish and Portuguese. At present a large element in nearly every country of South America consists of a mixture of Indian and European blood, known as mestizo, the Negro-European known as mulatto, and the Negro-Indian, called zambo. However, many Spaniards, Italians, Portuguese, and some Germans have settled in different sections. These people and their descendants comprise the leading commercial and industrial group. Population, 1956, 129,000,000.

POLITICAL DIVISIONS. All the political states of South America are republics except Guiana, which is divided about equally among England, France, and The Netherlands. The countries include Venezuela, Colombia, Ecuador, British Guiana, Dutch Guiana, French Guiana, Brazil, Peru, Bolivia, Chile, Paraguay, Uruguay, and Argentina.

HISTORY. Columbus discovered the continent of South America in 1498, when he cruised along the northern coast and explored a portion of the Orinoco. Two years later the coast of Brazil was explored by Pinzon and Diego de Lepe. Pedro Alvarez Cabral discovered the continent independently while on a voyage to India by the route around Africa, which had been opened by Vasco da Gama. He explored the vicinity of Bahia, in the eastern part of Brazil, but he supposed the region to be a part of Asia. In 1513 Balboa crossed the Isthmus of Panama and discovered the Pacific. Magellan passed the southern point of the continent in 1520, when he discovered Tierra del Fuego and probably the Falkland Islands. Explorations were soon after made of the interior by Gonzalo Pizarro and Orellana. Cabot explored the Paraná in 1528, and Irala established an overland route from the La Plata to Peru. Many Spanish explorers spent much time in the 16th and 17th centuries in search of El Dorado, the fabled king of a fabulous city that was supposed to exist somewhere in the northern part of South America.

The Spaniards and Portuguese began to claim all of South America as early as the 16th century, when they undertook to found colonies in different parts of the continent. Brazil was claimed by the Portuguese and Spain claimed the remainder of the coast. Later the two nations established claims to whatever lands they conquered, advancing steadily inland from the coasts. Francisco Pizarro captured Cuzco, the capital of the Incas, in 1533, and converted it into a Spanish settlement. He founded Lima two years later and made it the capital of his viceroyalty, which included the northwestern portion of the continent. Lima soon developed into an important city and became the center of a large trade. In the course of time the entire continent was claimed by the Portuguese and the Spaniards, the former settling in the eastern part and the latter in the northern and western sections. No other European countries attempted settlements in South America, except the French, Dutch, and English, who established claims to Guiana in the 17th century. These conditions remained stationary until the early part of the 19th century, when the Spanish and Portuguese colonies undertook to free themselves from the dominion of the Europeans.

Simon Bolivar, taking advantage of the Napoleonic Wars in Europe, and the War of 1812 in North America, developed a large following and eventually succeeded in establishing republics in Peru, Chile, Bolivia, Venezuela, and Argentina. Brazil became independent of Portugal in 1823, but retained a monarchical form of government until 1889, when the present republic was established. Negro slavery maintained a foothold until 1888, when it was finally abolished. For information concerning the nations of South America, see names of individual countries.

Democracy was the goal of the people in the new countries of South America, but most of them have been ruled more or less continuously by varying forms of dictatorship. However, the countries of South America have taken their places in the family of nations and the political scene is rapidly changing. At the present time South America is looking forward to an era of prosperity based on industrial and agricultural expansion.

Many of the products of South America such as meat, coffee, wheat, hides, rubber, tin, and oil, are needed by the world today, and efforts are being made to meet the worldwide demand for these products. The UNRRA (*q.v.*) would not have been able to feed such a large number of people as it has served had it not been for the food that South America was able to supply.

As methods of transportation and commerce increase in speed and efficiency, South America and North America are being united in closer hemispheric bonds, and both continents, through a Pan-American Union (*q.v.*), look forward to an era of peaceful progress.

Southampton (*sou-thăm[p]'tŭn*), a seaport city in southern England, in the county of Hampshire, on an estuary formed by the Test and Itchen rivers, 70 m. s.w. of London. The city is located on a natural harbor, which dominates its commercial and industrial life and has played a prominent part in its history. Its almost six miles of docking facilities are capable of handling the largest ships, and the city is England's leading overseas passenger terminal. A modern railway system connects Southampton with inland cities. Manufactures of the city include vehicle parts, flour, wire, petroleum, automobile tires, and electrical components. The history of Southampton dates back to Roman times, when it was called Clausentum. Among its most interesting ancient structures are the Bargate, Norman in architecture; Bitterne Manor House, also dating from Norman times; the Holy Rood Church (14th century); and Old Tudor House (*ca.* 1530). The city has been the point of departure for many historical expeditions. In 1189 the Crusade of Richard I set sail for the Holy Land from Southampton (see *Crusades*). The expeditions of Henry V against France embarked from Southampton's harbor in 1415, and in 1620 the Mayflower sailed for the New World from this city. During World War II the buildings and docks of the city were severely damaged by German air raids. Southampton is a popular resort. Population, 1961, 204,707.

South Australia (*south ạs-trā'lĭ-ȧ*), a state of the Commonwealth of Australia, situated in the southern and the central part of the continent. It is bounded on the north by the Northern Territory and Queensland, east by Queensland, New South Wales, and Victoria, south by the Southern Ocean, and west by Western Australia. The total area is 380,070 sq. m.

DESCRIPTION. The southern coast has more inlets of large size than any other part of the Australian shore. They include Spencer Gulf, Encounter Bay, and St. Vincent's Gulf. In the interior is an arid region with several mountain ranges and numerous lakes that have no outlet to the sea. In the central and southern part are the Stuart, Flinders, and other less important mountain ranges, with peaks from 1,500 to 4,000 ft. As a whole, the state is a vast plain with an undulating surface, but little elevation, and much of the interior is a desert of sandy tracts and marshes.

None of the streams is important except the Murray, which enters the southeastern part and flows into Encounter Bay. The Macumba and the Cooper rivers flow into Lake Eyre, which has no outlet to the sea. The lake region of the south-central part, which is shut off from the sea by the Gawler Range, has no visible outlet. The lakes within this region, besides Lake Eyre, include the Torrens, Gairdner, Frome, and Gregory lakes. During the dry season they are reduced to marshes with heavy salt crusts, but become quite deep during the periods of rains. In the interior the rainfall is very scant and the climate is extremely hot, but there is abundance of moisture and a corresponding fertility in the region adjacent to the southern coast. The dry season extends from December to March, when hot winds are frequent and the temperature rises to 118°. It seldom falls to 32°, but the climate is singularly healthful. At Adelaide, the chief port, the rainfall is 21 in.

The coast regions are moderately timbered with string bark, gum, pine. eucalyptus, and other trees, but in the interior regions forests are either absent or limited. The state possesses little value for agricultural purposes aside from the southern region, but it has excellent ranges for grazing. Water is not obtainable in some sections, and a supply of rain water is preserved in cisterns for use in the dry season. In some localities artesian wells abound and are utilized to some extent for irrigation.

INDUSTRIES. Mining is not so important as in some of the other Australian states. Rich deposits of copper occur and the mining of this metal is more extensive than that of any other. The absence of coal has made it impossible to work the deposits of iron ore, in which the state is rich. Other minerals include gold, lead, bismuth, granite, and limestone. The fisheries on the coast are extensive, especially in Spencer Gulf and the Gulf of St. Vincent. The manufactures are confined largely to products that are consumed locally and include flour, bread, machinery, canned fruits, pottery, and clothing. Flour is the chief manufactured product and large quantities are exported. Other exports include wheat, wool, wine, minerals, skins, hides, meats, dairy products, and livestock.

Agriculture is the principal occupation. In acreage under cultivation South Australia ranks second among the states of the Commonwealth, but the farming district is chiefly in the southern part. Tracts of considerable size are irrigated by water from rivers and artesian wells. Wheat and barley are the principal cereal crops, amounting to more than 88,500,000 bu. annually. Other products of importance are hay, oats, grapes, oranges, and lemons. Silk culture and the mulberry tree have been introduced with success. South Australia has large interests in raising sheep, of which there are more than 14,900,000 head in the state. Other domestic animals include cattle, horses, swine, and poultry. Much wine and wool are produced in this region.

GOVERNMENT. The governor is appointed by the British crown and is aided by an executive council of six members and the chief justice of the supreme court. Two chambers are included in the legislature, consisting of the legislative council, of 20 members, and the house of assembly, of 39 members. The members of the upper house are elected for five years by those adults who own property rated at £10 a year or who have matriculated at the university. The lower house members are elected for the duration of Parliament by the whole adult population.

The state maintains a system of public schools, at which attendance is free and compulsory between the ages of seven and 14 years. Many secondary schools are well established, but these are either private or denominational. The schools culminate in the Univ. of Adelaide, which has extensive courses and adequate facilities. Technical and industrial schools receive aid from the state.

The public utilities are largely owned and controlled by the state or by municipalities. Telegraph and telephone lines, including a telegraph system between Adelaide and Port Darwin, as well as the postal system, are owned by the government. Farmers are aided by loans on easy terms, and industrial disputes are settled largely by arbitration. Railroad building has been encouraged and at present 3,891 m. are in operation. Several fine harbors and the Murray River furnish good shipping facilities. The State of South Australia possesses over 55,000 m. of highways; there are also bus, trolley, and air services.

Inhabitants. The settlements are confined almost entirely to the southeastern part of the state. Nearly all the people are of British origin, chiefly English and Scotch, and those of foreign birth are largely Germans. In addition, there are about 2,700 full-blooded aboriginals living in an uncivilized state. In religious affiliation the people are Anglican, Methodist, Roman Catholic, Lutheran, Baptist, Presbyterian, and other denominations. Adelaide, on the Gulf of St. Vincent, is the capital and largest city. Other cities include Mt. Gambier, Port Adelaide and Port Pirie. The estimated population in 1960 was 969,258.

History. Navigators from Holland, Spain, and Portugal visited different sections of the coast at various times in the 16th and 17th centuries. The first English settlement was made in the vicinity of Port Adelaide, a short distance northwest of Adelaide, in 1836. Adelaide, on the Torrens River, soon after became the capital of a prosperous colony, which attracted many immigrants by the discovery of copper in 1843. Upon the discovery of gold in Victoria, in 1851, a large number of colonists left the settlement, but the development of pastoral and agricultural interests rapidly increased the population. South Australia became a constitutional colony in 1856, date of the present Constitution, after which the interior was explored. The Northern Territory was annexed in 1863. In 1900 it joined the federation of the Commonwealth of Australia. Later, in 1911, the Northern Territory became a part of the Commonwealth. See also *Northern Territory*.

South Bend (*bĕnd*), a city in northern Indiana, seat of St. Joseph County, on the St. Joseph River, 86 m. s.e. of Chicago. The city covers an area of 23.8 sq. m. and is served by five major railroad lines, among them the New York Central R.R. and the Grand Trunk Line. On the western outskirts is St. Joseph County Airport.

South Bend's landmarks include the cabin of the city's first white settler, Pierre Navarre, built in 1820; the LaSalle Monument; and St. Joseph County's courthouse (1854). The Cathedral of St. James (Protestant Episcopal) and St. Matthew's Co-Cathedral (Roman Catholic) are important religious edifices. South Bend has more than 50 parks and playgrounds, occupying 790 acres.

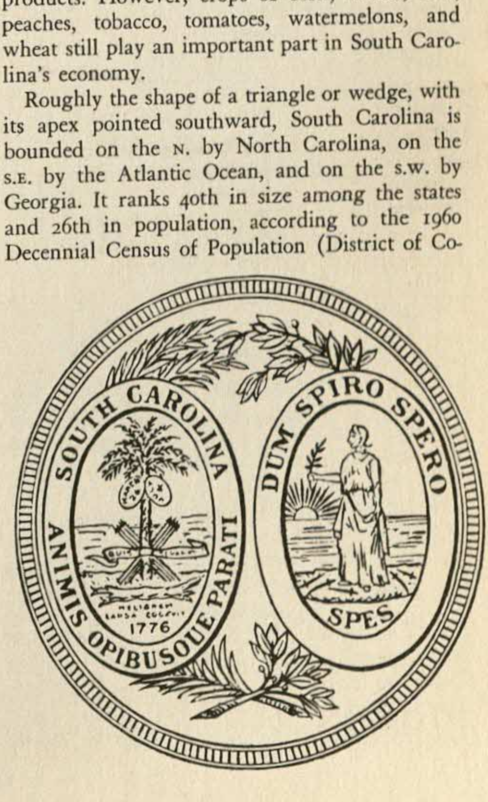
The South Bend trading area—seven counties in two states—comprises a population of *ca.* 640,000. Industries include the manufacture of automobiles, transportation equipment, farm machinery, tools, dies, clothing, toys, paints, and varnishes. The South Bend standard metropolitan statistical area (pop., 1960, 238,614) includes all of St. Joseph County. The city had a value added by manufacture of $265,366,000 in 1958.

The public-school system enrolls about 23,000 annually and the parochial schools, *ca.* 8,500. South Bend is the site of the Univ. of Notre Dame and St. Mary's Coll.

First settled in 1823, South Bend was incorporated as a town in 1835 and as a city in 1865. It has a government consisting of a mayor and a council. Its population increased from 128 in 1830, to 35,999 in 1900, and to 115,911 in 1950. In 1960 the population was 132,445.

South Carolina (*south ḳăr-ō-lī′nạ*), a state in the South Atlantic section of the U.S., one of the 13 original states of the Union and the eighth to ratify the Federal Constitution. It is known both for its beautiful historic gardens and its modern textile mills. Once primarily agricultural, the state has become increasingly industrialized, and today the cash value of farm products is outranked by that of the factory products. However, crops of corn, cotton, oats, peaches, tobacco, tomatoes, watermelons, and wheat still play an important part in South Carolina's economy.

Roughly the shape of a triangle or wedge, with its apex pointed southward, South Carolina is bounded on the n. by North Carolina, on the s.e. by the Atlantic Ocean, and on the s.w. by Georgia. It ranks 40th in size among the states and 26th in population, according to the 1960 Decennial Census of Population (District of Co-



lumbia included in both rankings). Its name was given it in 1629 by Charles I (from *Carolus*, Latin for "Charles") when he granted Sir Robert Heath a patent to the "Province of Carolana." The state's nickname, the "Palmetto State," is derived from the fact that a half-finished fort of sand and palmetto logs (battle of Ft. Moultrie, June 28, 1776), on Sullivan's Island just outside Charleston, staved off a British invasion of the Southern colonies.

Location	Between 78°31′ and 83°23′ W. long. and 34°4′ and 35°12′ N. lat.
Area	31,055 sq. m.
Land	30,272 sq. m.
Inland water	783 sq. m.
Greatest extent:	
North to south	ca. 285 m.
East to west	ca. 235 m.
Population (1960)	2,382,594
Capital city	Columbia
Highest point	Sassafras Mt. (3,560 ft.)
Lowest point	Sea level (Atlantic Ocean)
Entered the Union (8th state)	1788
Song	"Carolina," words by Henry Timrod, music by Erroll H. Colcock
Flower	Yellow jessamine
Bird	Carolina wren
Mottoes	*Animis Opibusque Parati* (Latin, meaning "Prepared in Mind and Resources"), and *Dum Spiro Spero* (Latin, meaning "While I Breathe, I Hope")
Flag	See color plate in Vol. XI

GEOGRAPHY

South Carolina consists of two-thirds "low country," or coastal plain, and one-third "up country," consisting of the Piedmont Plateau area and the Blue Ridge range of the Appalachian Mts. in the northwest. The fall line, dividing low country from up country, runs diagonally across the state from northeast to southwest, approximately 125 m. inland, on a line approximately Chesterfield-Columbia-Augusta (Ga.). The coastal plain was once ocean floor. The upland soil is derived from the underlying crystalline rocks and ranges from gravelly loam and sandy loam to sandy clay loam. Almost three-fifths of the state is forested (half pine, half hardwood). The coast from the North Carolina border to Winyah Bay has many fine beaches. The remaining three-quarters of the coast is broken into many inlets and estuaries protected by low, sandy islands. The coastal region contains numerous curious depressions, believed to have been caused by a prehistoric meteorite shower and known as "meteor bays." Beaufort County, in the extreme south, consists largely of islands, 65 in number.

South Carolina has three main river systems: the Pee Dee in the northeast, the Santee in the central part, and the Savannah in the southwest. The Edisto River, in the southeast, is independent of these three systems. All the rivers flow generally southeast. The swift up-country streams provide abundant hydroelectric power for industrial operations. There are few natural lakes, but several lakes have been created by power dams; among the larger are Lakes Murray, Marion, and Moultrie, and the Clark Hill Reservoir.

The state has played an important part in American history, notably in the Revolutionary War and the Civil War. It is particularly known, however, for its striking houses and beautiful gardens. The hot low-country climate very early caused interesting modifications of Georgian (so-called Colonial) domestic architecture and also made possible the establishment of formal gardens on a scale impossible in the more northerly colonies. In the 1890's, Baedeker's famous "Guide" listed three "musts" to be seen in America: the Grand Canyon, Niagara Falls, and Charleston's Magnolia Gardens. Among other famous low-country gardens are Belle Isle, Brookgreen, Cypress, Harrietta, Jones Lotus, Mateeba, Middleton, and Pierates Cruze. The better-known inland gardens include Dunndell, Edisto, Lamis, Kalmia, and Swan Lake.

Among the state's famous residences are Let's Pretend at Aiken, home of Gouverneur Morris; Woodrow Wilson's boyhood home, Columbia, now a museum; Hampton Plantation, McClellanville, home of Archibald Rutledge; and Ft. Hill, Clemson College, once the home of John C. Calhoun. Charleston has a noteworthy row of houses on its historic and picturesque Battery; Rainbow Row, a group of typical old houses noted for quaint coloring; and Pringle House, dating to 1765, an example of "double house." Cabbage Row in Charleston inspired the setting, there called "Catfish Row," of George Gershwin's folk opera "Porgy and Bess."

Saint David's Church (Episcopal) in Cheraw, one of the oldest churches in the South, was built by Welsh settlers in 1770-73 and used by the British during the Revolution as a smallpox hospital. The Church of Prince George, Winyah (Episcopal), in Georgetown was organized in 1721; the present structure dates from 1742-46.

In Charleston, St. Philip's Episcopal Church was built in 1835-38; it is the burial place of many famous South Carolinians. Another notable building is the State House, Columbia, its walls marked by Federal shellfire in the Civil War; a unique feature of its richly landscaped grounds is a palmetto tree in cast iron, a monument to the Palmetto Regiment which distinguished itself in the Mexican War.

South Carolina has many fine resorts and beaches. Myrtle Beach, the largest seashore resort, is open the year round. Aiken, in the west central sand hills, is a winter resort known as the "polo capital" of the U.S. Beaufort, on Port Royal Island, the second-oldest town in the state, is a year-round resort. Other resorts include the Isle of Palms, northeast of Charleston; Glenn Springs, in Spartanburg County, known for its mineral springs; Folly Beach, south of Charleston; Camden, northeast of Columbia, another year-round resort; and Caesar's Head, northwest of Greenville, a mountain resort. East of Beaufort is St. Helena Island, the home of the Gullah Negroes, a primitive group of pure African stock with an extraordinary dialect. One of the major installations of the U.S. Marine Corps is located on Parris Island, near Beaufort.

There are also 157,824 acres devoted to national wildlife refuges (Cape Romain, Carolina Sand Hills, Santee, and Savannah); among the native fauna here preserved are geese, ducks, rails, brown pelicans, terns, herons, white ibises, quail, wild turkeys, raccoons, deer, otters, alligators, and sea turtles.

ISSAQUEENA FALLS

Unspoiled natural beauty, such as this scene near Walhalla, abounds in South Carolina

ANNUAL STATE EVENTS

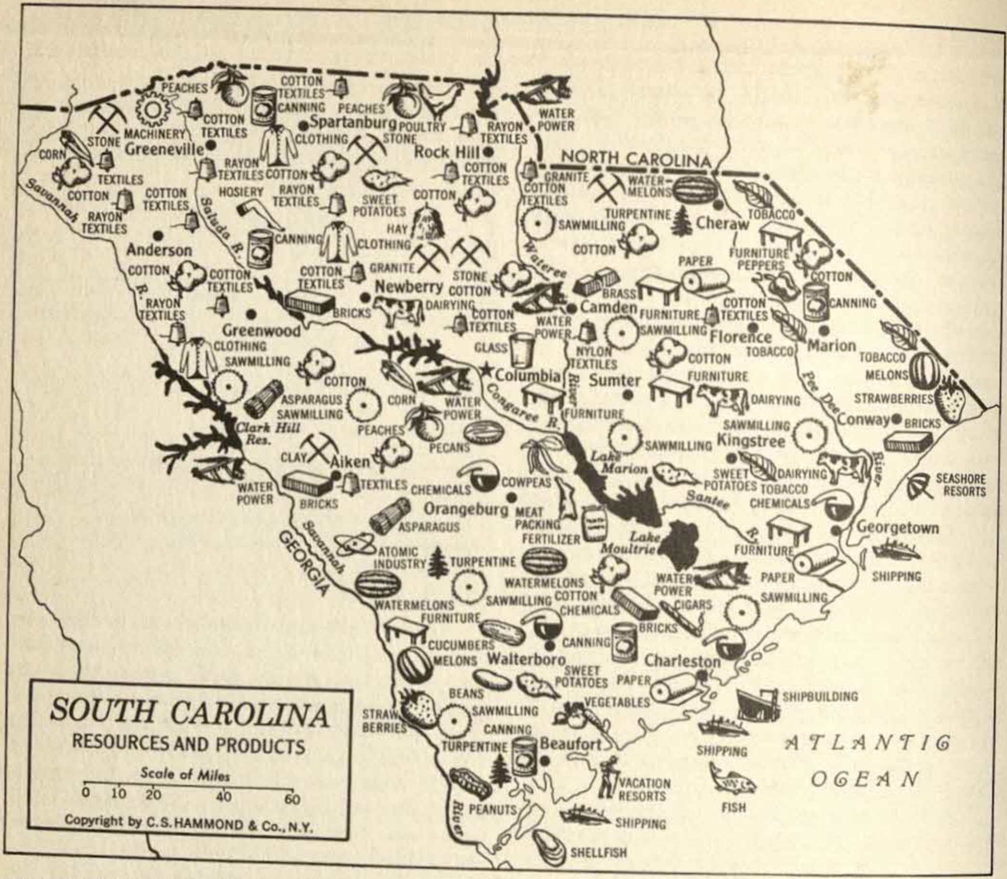
Polo Games	January through March, three times weekly; Aiken and Camden
Azalea Festival	Six days in March or April; Charleston; many private homes open for tours; also a parade, a ball, a street-criers' contest, flower shows, a water carnival
State Music Festival	Third week in April; Rock Hill; piano, choral, and band competition
Confederate Memorial Day	April 26; statewide
Watermelon Festival	Last week in June; Hampton; concert, motorcycle races, beauty contest, ball, barbecue
State Fair	Third week in October; Columbia
Palmetto State Fair (Negro)	Fourth week in October; Columbia

Climate: Although altitudes vary from sea level to *ca.* 3,000 ft. in the mountains, South Carolina is far enough south so that there are no marked extremes in temperature. The summers are long and hot, the winters generally mild. Temperature and humidity are subtropical in the southeast and moderate in the central areas; the climate in the northwest tends to be cool and dry. Rainfall is evenly distributed throughout most of the state. In the north and northwest snow falls occasionally, but in the south only rarely. The entire coastal area lies in the normal path of seasonal hurricanes, but these are, fortunately, fairly rare.

Normal temperature, Columbia	
January	47.9° F.
July	80.8° F.
Annual mean	64.4° F.
Latest frost, Columbia	April 13
Earliest frost, Columbia	Nov. 1
Precipitation, Columbia	
January	2.84 in.
July	5.74 in.
Annual	41.58 in.
Average growing season, Columbia	248 days

NATURAL RESOURCES

During the 20th century, South Carolina has developed its water power, with a resultant steady growth in industry, particularly marked between 1940 and 1950. The recent development of up-to-date soil-conservation techniques and the abandonment of the one-crop cotton economy have improved the state's agricultural position. Hydroelectric plants on the Santee, Saluda, Savannah, and other rivers provide power for the state's textile and other industrial plants. A U.S. hydrogen fuels project (for the Atomic Energy Commission) is located on a



200,000-acre tract in Aiken and Barnwell counties on the Savannah River. The Saluda Dam on the Saluda River west of Columbia, completed in 1930, is one of the largest earthen power dams in the world, 208 ft. high and 7,838 ft. long, with a highway running along its top. Other major dams include the Buzzard Roost Dam on the Saluda River east of Greenwood, the Santee-Cooper Dam, across the Cooper River at Lake Moultrie, and the Clark Hill Dam northwest of Augusta, Ga., which impounds the Clark Hill Reservoir.

South Carolina has *ca.* 11,940,000 acres of forest lands, and saw-timber volume is estimated at 32,300,000,000 bd. ft. The state ranks 12th in production of lumber. Merchantable softwoods include pine and cypress (90 per cent Southern yellow pine). The predominant hardwoods are red gum, oak, yellow poplar, soft maple, tupelo, and black gum. Forest products include poles, piling, lumber, logs, veneer, furniture stock, railroad ties, pulp, fuel, turpentine, rosin, and tar.

Fishing is also important economically. The state ranks second in the U.S. in the packing and shipping of oysters. Other leading seafoods are shrimps, clams, crabs, and mullet. Menhaden also are caught. In 1956 fishery products were valued at $2,450,000.

Mineral production is negligible, although the state does produce granite, limestone, phosphate rock, clays, gravel, manganese, and a slight amount of gold. Near Aiken occur some of the largest and purest sedimentary kaolin and clay deposits in the U.S., and granite is quarried in 19 counties.

Soil-conservation measures were begun when gullying and sheet erosion of the uplands became a major problem after these areas had been denuded of natural forests. Countermeasures include tree planting, strip cropping, and crop rotation. Two of the largest conservation projects are the Fishing Creek area in Chester and York counties and the South Tiger River area in Spartanburg and Greenville counties.

SOUTH CAROLINA'S ECONOMY

Agriculture, long the mainstay of the economy of South Carolina, within the past two decades has fallen into second place behind manufacturing. In 1950 about 28 per cent of the state's 755,233 employed workers were engaged in manufacturing, and more than 25 per cent in agriculture. Wholesale and retail trade ranked third, with more than 13 per cent. In manufacturing, the greatest increase took place in the textile fields: the number employed in textile mills rose by *ca.* 33 per cent, while the number employed in the fabrication of textile products rose more than fourfold between 1940 and 1950. Employment in lumber and in furniture and wood-products manufacture rose by 35 per cent. The largest single increase in workers employed came in the construction industry, a rise of 87 per cent.

South Carolina is now one of the leading states in the employment of workers in the production of yarn, thread, and fabrics, and in the dyeing and finishing of textiles. Textile mills represent 66 per cent of the state's industry; since World War II the annual value of textile products has increased from $787,000,000 to $1,773,000,000. Other important manufactures include wood products (furniture, boxes, barrels, pulp and paper), chemicals, cottonseed oil, brick, cement, and foodstuffs. The total value added by manufacture in 1956 was $1,386,000,000.

In 1954 South Carolina had 124,203 farms, a decrease of nearly 35,000 since 1930. Farm acreage totaled 11,069,000, with 89.1 acres the average per farm. Indigo and rice, the main staple low-country crops of earlier days, were replaced early in the 19th century by tobacco and cotton as the major money crops. In 1957 the state ranked fourth in the production of tobacco (farm value, $76,834,000). Cotton was second in state production (1957 farm value, $60,872,000). Other leading crops, in order of value, were corn, hay, sweet potatoes, Irish potatoes, barley, and rice. Fruit and truck crops are important; the leading products are peaches, melons, grapes, tomatoes, asparagus, cabbages, and onions. Soybeans are increasing in importance. Recent years have seen increasing numbers of beef and dairy cattle and hogs. Sheep raising has been revived in the Pee Dee area, the northern part of the state's coastal plain. The 1957 cash income from crops, livestock, and government payments was $338,624,000.

The state contributed less than 1 per cent of total U.S. mineral production in 1957 and ranked 43rd; its mineral output for that year was valued at $22,000,000. The principal minerals in order of value are limestone (cement), clays, sand, and gravel.

Transportation and Communication

Seaborne commerce is important; Georgetown, Charleston, and Beaufort have sheltered natural harbors, and the Intracoastal Waterway runs down the whole length of the state's Atlantic coast. South Carolina is served by 20 railroads. The first railroad to operate in the state was the South Carolina R.R. (now a part of the Southern Ry.), which in December 1830 ran, out of Charleston, the first steam-locomotive train in the U.S. Other principal railroads include the Seaboard Air Line R.R. and the Atlantic Coast Line R.R. Railroad mileage in 1956 totaled 3,287 m. The principal cities have airfields. In 1957 the state had 54,643 m. of roads, of which 29,499 m. were surfaced. In 1957 South Carolina had 82 radio stations and ten television stations. The first newspaper published in the state was the *South Carolina Weekly Journal* (1730), in Charleston. Among the leading newspapers today are the Charleston *News and Courier* and *Post,* the Columbus *Record* and *State,* and the Spartanburg *Herald* and *Journal*.

Population

South Carolina has 46 counties. The state's 1950 urban population comprised 36.7 per cent of the total population; the rural population, 63.3 per cent. Between 1940 and 1950 the urban population rose by 30.7 per cent over that of 1940, the rural population by 5.2 per cent. South Carolina's population was estimated at 2,404,000 on July 1, 1958. In 1950 white persons numbered 1,293,405; of these, 1,285,902 were native born and 7,503 were foreign born. Nonwhite persons totaled 823,622; of these, 822,077 were Negroes and 554 were American Indians. Population density in 1950 averaged 69.9 per sq. m.

The major religious faith in 1950 was the Protestant; there were a small Roman Catholic

TOBACCO FARM

South Carolina ranks fourth in tobacco production, although agriculture has taken second place to manufacturing

group and a very small Jewish group. The predominant Protestant bodies were the Southern Baptist Convention, The Methodist Church, the Presbyterian Church in the U.S., and the United Lutheran Church in America.

Chief Cities: Columbia, the state capital, just north of the center of the state, is the largest city, a focal point for the state's textile and other industries. It is the seat of the state university.

Charleston, on the coast in the southeast, is the second-largest city, famous as a port, for its history, and for its gardens. The South's noted military academy, The Citadel, is located here.

Greenville, in the northwest, is the third-largest city, important for textile manufactures.

Spartanburg, also in the northwest, is the fourth-largest city, important for textile manufactures and as the center of the state's peach-growing area.

Famous Men and Women: Baruch, Bernard Mannes (1870-), financier and adviser to several U.S. Presidents.

Byrnes, James Francis (1879-), public official, U.S. Senator (1931-41), who held important government positions during and after World War II; governor of South Carolina (1951-55).

Calhoun, John Caldwell (1782-1850), Vice President of the U.S. (1825-32). He was a spokesman for states' rights in the U.S. Senate and a brilliant debater.

Heyward, Du Bose (1885-1940), poet, playwright, novelist; his "Porgy" was the basis for the Heyward-George Gershwin folk opera "Porgy and Bess."

Longstreet, James (1821-1904), lieutenant general in the Confederate Army.

Marion, Francis (1732?-95), guerrilla fighter, known as the "Swamp Fox," who harassed the British during the Revolutionary War.

Middleton, Arthur (1742-87), planter, signer of the Declaration of Independence, author of a constitution for the state.

Middleton, Henry (1717-84), second president of the Continental Congress, designer (1741) of the Middleton Gardens, oldest formal gardens in the U.S.

Peterkin, Julia (1880-), novelist and Pulitzer Prize winner, known for her studies of Gullah Negroes.

Pinckney, Charles Cotesworth (1746-1825), patriot and statesman, author of many provisions of the U.S. Constitution.

Poinsett, Joel R. (1779-1851), world traveler, U.S. Secretary of War (1837-41), minister to Mexico, whence he imported the Poinsettia (*q.v.*) shrub named for him.

Rutledge, Archibald (1883-), state poet laureate.

Simms, William Gilmore (1806-70), poet, novelist, and playwright, who is best known for his historical novels.

Timrod, Henry (1828-67), poet and journalist, known as the "poet laureate of the Confederacy."

EDUCATION

Education is free and compulsory for children between seven and 16. The first free school in South Carolina was established in 1710; the state's public-school system was established in 1868. Public-school enrollment in 1958 totaled 535,800. The leading state-supported institutions of higher learning include the Univ. of South Carolina, Columbia; The Citadel (military) and the South Carolina Coll. of Medicine, Charleston; Clemson Agricultural Coll., Clemson; and Winthrop Coll. (for women), Rock Hill. Private institutions include Furman Univ., Greenville; Wofford Coll., Spartanburg; and Limestone Coll., Gaffney. The Tamassee School for Mountain Children near Walhalla is operated by the Daughters of the American Revolution; the John de la Howe School near Willington is the oldest manual-training school in the U.S. (founded in 1787). At the time of the 1954 Supreme Court decision regarding desegregation, separate schools were maintained for white and Negro pupils. The state-supported South Carolina State Coll., at Orangeburg, and the privately supported Benedict Coll. and Allen Univ., at Columbia, have traditionally been attended by Negroes.

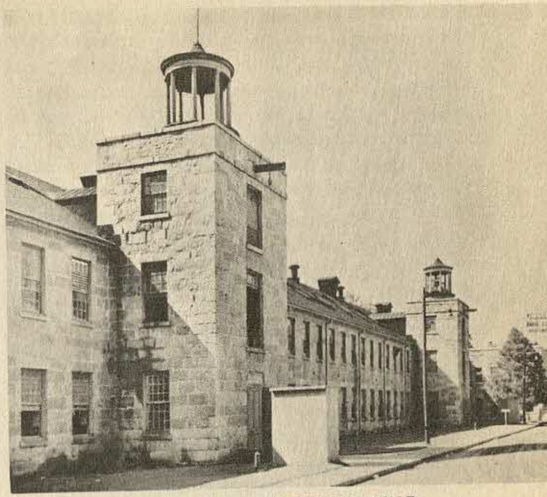
Cultural institutions include the collection of the Carolina Art Assn. in the Gibbes Memorial Art Gallery, Charleston; the Caroliniana Library at the Univ. of South Carolina, Columbia; a collection of rare South Carolina books, manuscripts, and historical data in the public library and museum, Florence; and a children's nature museum in Fewell Park, Rock Hill. The first building in America (built in 1736) to be devoted wholly to the drama was the Dock St. Theatre, Charleston; a newer theater, nearby, with the same name, in period architecture, is currently used by "Little Theater" groups.

GOVERNMENT

South Carolina is governed under provisions of a constitution dating from 1895. Executive authority is given to a governor, lieutenant governor, secretary of state, controller general, attorney general, adjutant general, commissioner of agriculture, and superintendent of education, each elected for a term of four years and ineligible to succeed himself. There is also an insurance commissioner, elected by the legislature for a four-year term. The legislature consists of a senate of 46 members, elected for four-year terms (one-half renewable every two years), and a house of representatives of 124 members,

PARRIS ISLAND MONUMENT TO HUGUENOTS

French colonization in 1562 failed, but the Huguenots were an important group in the early settlements



PIONEERING TEXTILE MILL AT GRANITEVILLE

Textiles are now one of the state's most important industries (*courtesy S.C. State Development Board*)

CHARLESTON'S DOCK STREET THEATER

Of French colonial design, the building exemplifies the iron grid work of the period

MECHANICAL COTTON PICKER

Mechanization has increased productivity and paved the way to diversified farming

STACKS OF RAILROAD TIES AT A SPARTANBURG LUMBER YARD

Great forests supply the timber for a leading industry

elected every two years. The legislature meets annually in January in Columbia, the state capital; the length of the session is not limited by law, but the legislators may not be paid for more than 40 days. The state supreme court consists of five members (a chief and four associate justices), all elected by the legislature for terms of ten years. The judicial system also includes 14 circuit-court judges, elected by the legislature for four-year terms. There are also county courts and justice magistrates. South Carolina is represented in the U.S. Congress by two Senators and six Representatives.

HISTORY

South Carolina was originally inhabited by 28 Indian tribes, the most important being the Sioux, Cherokee, Cusabo, Westo, Shawnees, Saluda, Apalachee, Yamasee, Catawba, and Peedee. The first settlement, founded in 1526 by Lucas Vásquez de Ayllón, with some 500 colonists from Hispaniola, did not last; later Spanish settlements, dating from 1566, were successful. In 1562 a Frenchman, Jean Ribaut, founded the first Protestant settlement in North America at Port Royal, but this did not survive. In 1629 Charles I granted a patent to Sir Robert Heath for the "Province of Carolana," but no settlements were founded, and in 1663 Charles II granted eight of his favorites a patent for a strip of land that included the present area of North and South Carolina and extended, in theory, westward to the Pacific Ocean. The first settlers under this patent arrived in 1670 at Albemarle Point and in 1680 founded Charles Town. The provinces of North and South Carolina were separated *ca.* 1713, although the boundaries did not become firm until 1815. In its early days, the colony was harassed by Indians, French, Spanish, and pirates, including the notorious Blackbeard. The area also was plagued with malaria, hookworm, and pellagra until the 20th century. The first public library in the colonies was established in Charleston in 1698.

Four South Carolina delegates signed the Declaration of Independence, and the first decisive victory of the Revolutionary War was won at Ft. Moultrie, then known as Ft. Sullivan, in 1776. Nearly 150 engagements were fought on South Carolina soil, and the battle of Kings Mt. (Oct. 7, 1780) is regarded as a major turning point of the war.

The cotton-and-slave economy gained a strong foothold in South Carolina. The state was the first to secede from the Union (Dec. 20, 1860), and the Civil War was formally opened when Confederate troops fired upon the Federal garrison at Ft. Sumter in Charleston Harbor (April 12, 1861). From a white population in 1861 of 291,300, South Carolina sent 62,838 men to the Confederate Army, of whom 22 per cent died in battle or in prison. The state was devastated by Gen. William T. Sherman in 1865 when he marched across it from Savannah. From the end of the Civil War until 1877, the state was under military rule. It was readmitted to the Union in 1868, but it was many years before the state recovered from the ruinous period of the Reconstruction.

In the 20th century, South Carolina began to conquer its disease problems and to enter the industrial era. The latter development stemmed, and still stems, largely from Northern industry

MAJOR RECREATIONAL AND HISTORIC FEATURES

Name and Type	*Size and Location*	*Points of Interest*
Ft. Sumter National Monument (established 1948)	2 acres, on an island in Charleston Harbor (U.S. 17, 52)	Scene of engagement marking beginning of the Civil War (April 12, 1861)
Kings Mt. National Military Park (established 1931)	4,012 acres, near the center of the Carolina border (U.S. 29; state 161)	Site of an important victory for American frontiersmen at a crucial point in American Revolution, Oct. 7, 1780; adjoins 6,141-acre Kings Mt. State Park
Cowpens National Battlefield Site (established 1929)	1 acre,in the north (U.S. 29A; state 110)	Site of Daniel Morgan's victory over the British under Banastre Tarleton, Jan. 17, 1781
Francis Marion National Forest (established 1936)	414,701 acres, along the coast in east-central South Carolina (U.S. 17, 52; state 41)	Ruins and remnants of early colonial settlements and plantations; meteor bays, moss-hung oaks; fishing, hunting
Sumter National Forest (established 1936)	1,008,639 acres, in Blue Ridge Mts., in the northwest (U.S. 25, 72, 76, 176, 221, 378; state 28, 72, 107)	Piedmont and Blue Ridge Mts. area; Walhalla trout hatchery; scenic drives; hunting
Cheraw State Park (established 1934)	7,361 acres, in the northeast (U.S. 1, 52)	Typical sand hill country; lake stocked with hatchery fish; beach, boating, hiking trails, camping
Greenwood State Park (established 1938)	1,114 acres, in the northwest (state 702)	Borders 20-m.-long lake created by Buzzard Roost Dam on Saluda River; boating, picnicking
Hunting Island State Park (established 1938)	5,000-acre island in Atlantic Ocean, near southernmost tip of South Carolina (U.S. 21)	Wide beach; ca. 3,000 acres of virgin pine, live-oak, and palmetto forest; abundant wildlife; abandoned 136-ft. lighthouse
Santee State Park (established 1941)	2,364 acres, in the southeast (U.S. 301; state 6)	On shores of 35-m.-long Lake Marion, Santee-Cooper Impoundment; boating, swimming, fishing
Table Rock State Park (established 1935)	2,860 acres near far northwest corner of South Carolina (U.S. 178; state 288)	Includes Table Rock (3,124 ft.) and Pinnacle Mt. (3,436 ft.); streams, waterfalls, rock cliffs, lake with beach

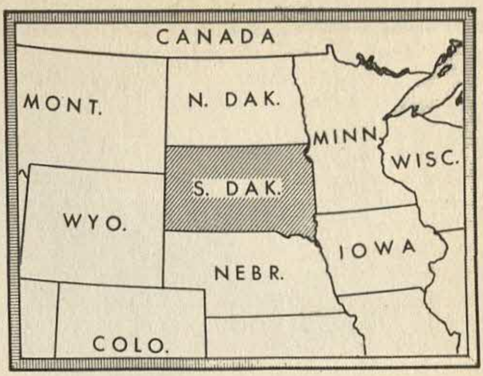
seeking year-round good weather, inexpensive power, and a favorable "labor climate." South Carolina supplied 63,097 residents for World War I and 197,556 men and women for World War II, as well as providing numerous year-round military training camps and staging areas. Since World War II, soil conservation and further developments in hydroelectric (and, more recently, nuclear) power have still further raised the state's industrial and economic potential.

See also separate entries on most of the individuals and geographical and historical subjects mentioned in this article.

South Carolina, UNIVERSITY OF, a coeducational state institution of higher learning at Columbia, S.C., opened in 1805 and reorganized under the present name in 1906. Courses are offered in arts and sciences, business administration, education, engineering, journalism, law, and pharmacy. Extension courses are also offered. It has a junior campus at Florence, S.C. The library has 350,000 volumes. The annual student enrollment totals *ca.* 5,000, and there are *ca.* 275 members of the faculty. The physical plant is valued at *ca.* $20,850,000.

South Dakota (*south dă-ḳō'tă*), a state in the West North Central section of the U.S., the nation's leader in sheep raising, and one of the country's outstanding producers of grain crops. South Dakota in 1957 stood second in rye and wild hay production, third in beef cows, and fourth in durum wheat and oats. A land of vast sweeping plains, South Dakota is also the site of the Black Hills, the highest mountains east of the Rockies. Scene of a gold rush in 1875, the state is today first in the nation in the mining of that metal.

South Dakota is bounded on the N. by North Dakota, on the E. by Minnesota and Iowa, on the s. by Nebraska, and on the w. by Wyoming and Montana. It ranks 16th among the states in size and 41st in population, according to the 1958 estimates of civilian population (Alaska, Hawaii, and the District of Columbia included in both rankings). The state's name comes from the name the Sioux Indians gave their own tribe —*Daḳota,* meaning "friends." South Dakota is nicknamed the "Coyote State" and the "Sunshine State."



Location	Between 96°26′ and 104°3′ W. long. and 42° 29′ and 45° 57′ N. lat.
Area	77,047 sq. m.
Land	76,536 sq. m.
Inland water	511 sq. m.
Greatest extent:	
North to south	245 m.
East to west	380 m.
Population (1950)	619,636
Capital city	Pierre
Highest point	Harney Peak (7,242 ft.)
Lowest point	Big Stone Lake (962 ft.)
Admitted to the Union (39th state)	1889
Song	"Hail, South Dakota," words and music by Decort Hammit
Flower	Pasqueflower
Bird	Chinese ring-necked pheasant
Motto	"Under God, the People Rule"
Flag	See color plate in Vol. XI

GEOGRAPHY

Geographically, South Dakota may be divided into three regions: the eastern lowland, the western plain, and the Black Hills region. The Missouri River cuts the state almost in half, flowing from north to south and slightly toward the east. East of the river is a plain once covered by the great glacier that pushed its way down from the Arctic in ages past. The melting of the glacier left behind a number of lakes and moraines, or piles of boulders, marking its onetime line of advance. In places, the glacier left hills of stones that have become covered with soil and vegetation, but generally it planed the countryside flat. Elevations in eastern South Dakota average about 1,400 ft. The state's lowest elevation is here, 962 ft. at Big Stone Lake. Across the Missouri River, the terrain gradually becomes more rolling, as this region was beyond

Burlington Route Photo

IN THE BLACK HILLS OF SOUTH DAKOTA

Grotesquely eroded rocks are found throughout the area

the glacier's reach. Elevations on the western plain are well over 2,000 ft. This area is considerably drier than the eastern lowland, and the plant life is sparse. Buttes, or flat-topped mountains, rise from the plain; and between the buttes are gullies and canyons, cut by the erosion of wind and water. The most impressive scenery of this type is in the Bad Lands of the White River Valley. The many fossils found in the Bad Lands indicate that it was once a tropical jungle, but today the land is parched and lifeless.

In the southwest corner of the state, the land changes abruptly into mountain country. Here are the Black Hills, so-called because of the dark appearance created by the dense growth of evergreen trees. The Black Hills contain the only considerable gold workings in the U.S., and their timber is much needed and much used by the inhabitants of the surrounding treeless plains. Harney Peak (7,242 ft.) is the highest elevation in the state, and the Black Hills contain many peaks over 6,000 ft.

The Missouri is the principal river of South Dakota and once was the main artery of transportation. Today, it is dammed to provide irrigation and hydroelectric power. The Missouri's main tributaries are the Grand, Moreau, Cheyenne, and White rivers, running generally east and west, and the James or Dakota River, which joins the Missouri after crossing the state from north to south. The Bois des Sioux of the north forms part of the state's eastern boundary. Among the state's larger lakes are Big Stone Lake, and Traverse, Waubay, Poinsett, and Kempeska lakes, all in the eastern part of the state.

With the admission of Alaska to the Union in 1959, the geographic center of the U.S., formerly established in Kansas, was redetermined and placed in Butte County, South Dakota, 20 m. E. of the junction of the state with Montana and Wyoming. The Black Hills are the state's principal tourist attraction, and their most interesting features have been made into a state park. A protected herd of buffalo grazes here, the largest remnant of the herd of 60,000,000 that once covered the Great Plains. Here, too, is Mt. Rushmore, where the sculptor Gutzon Borglum carved from a mountainside colossal portraits of Presidents Washington, Lincoln, Jefferson, and Theodore Roosevelt. The height of each face is 60 ft., enabling the viewer to see them from miles away. Cut from granite, they are expected by their sculptor to remain intact for more than 100,000 years. Another Black Hills attraction is the town of Deadwood, home of "Wild Bill" Hickok and Calamity Jane. Nearby is the Homestake Mine, the largest gold mine in the nation. One of the interesting sights of eastern South Dakota is the Corn Palace. This auditorium in Mitchell is topped with fairylike domes, and the entire surface of the building is newly decorated each year with mosaics worked of varicolored corn. From Germany came the troupe of actors, who, every summer, produce the famous Spearfish Passion Play, a re-enactment of the last days of Christ. South Dakota, the original home of the Sioux tribes, has a large Indian population, many of whom live on the Standing Rock, Cheyenne River, Rosebud, and other reservations.

Climate: Located in the heart of the continent, far from any natural bodies of water large enough to influence its climate, South Dakota has great extremes of temperature. Winters are long and very cold, and summers are short and quite hot. Both the heat and cold are made more tolerable by the dryness of the air. Rainfall is light, especially in the western section of the state. The most rainfall occurs during the months of May to August.

Normal temperature, Rapid City	
January	20.0° F.
July	71.0° F.
Annual mean	45.3° F.
Latest frost, Rapid City	May 1
Earliest frost, Rapid City	Oct. 4
Precipitation, Rapid City	
January	0.45 in.
July	2.08 in.
Annual	16.18 in.
Average growing season, Rapid City	156 days

NATURAL RESOURCES

South Dakota's most productive resource is its fertile soil. Most of the state's soil is light and powdery, but a belt of land across the eastern edge has a chestnut-brown soil with a high limestone content. Climatic conditions favor the growing of grain and corn in the east and ranching and irrigation farming in the west. The development of the Missouri River Valley by a series of dams, some recently completed and others under construction, will increase the cultivated land in the state by furnishing more water for irrigation. Hydroelectric power will be another important benefit of this project. Among the most important are Oahe and Ft. Randall dams, on the Missouri River, both under construction in 1959.

One of the few large stands of timber in the Great Plains region is located in the Black Hills of South Dakota. The state's forest land was estimated at 2,169,000 acres in 1953; and the 1952 cut of saw-timber amounted to 42,000,000 bd. ft., almost entirely of softwoods. The principal commercial tree is the ponderosa pine.

South Dakota is first in the nation in the production of gold. Silver, recovered as a by-product of the gold-smelting process, is also important. Lignite is found in the northwest corner of the state and is mined for local use. Other mineral deposits include uranium, feldspar, mica, bentonite, granite, gypsum, limestone, lithium, and clay.

Conservation activities in South Dakota are numerous and varied. Flood control is being undertaken in the damming of the Missouri River. Steps are taken to protect wild game (especially buffalo, which are increasing in number). Soil conservation is fostered by the planting of windbreaks and the removal from cultivation of land where rainfall is too undependable for crop farming. The forests of South Dakota have been placed on a sustained-yield basis, to insure their continued existence as a commercial and recreational resource of the state.

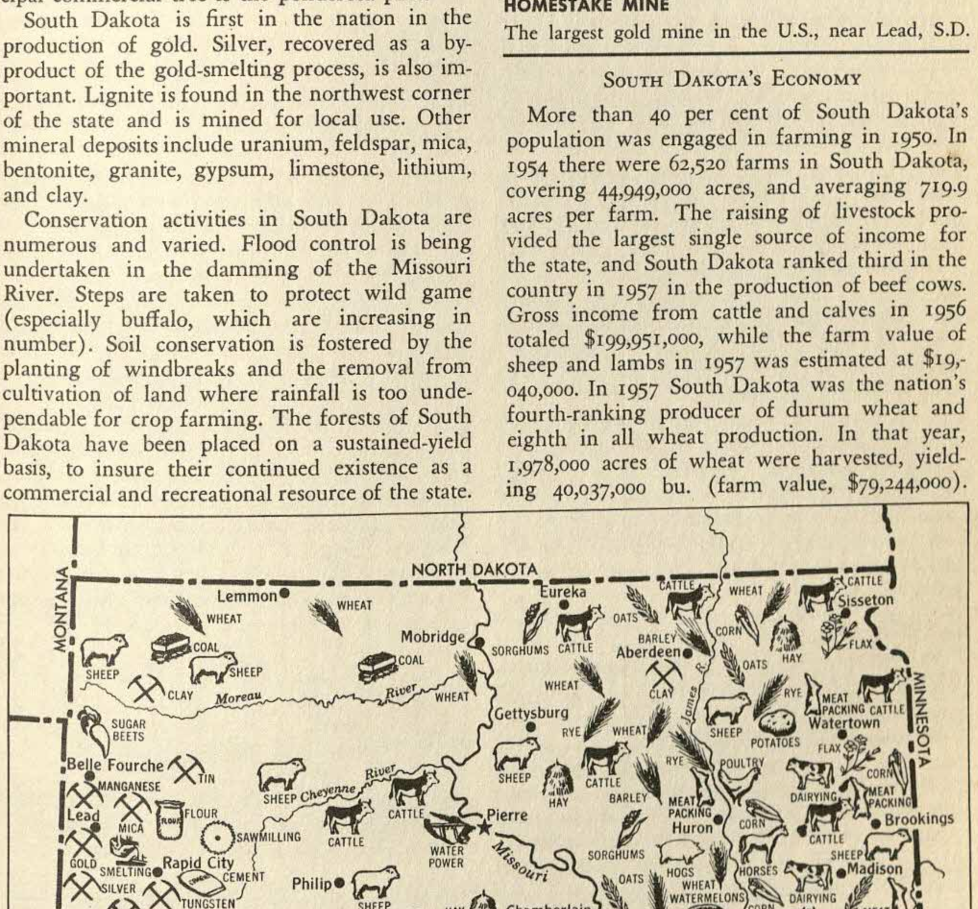
Courtesy South Dakota Highway Commission

HOMESTAKE MINE

The largest gold mine in the U.S., near Lead, S.D.

South Dakota's Economy

More than 40 per cent of South Dakota's population was engaged in farming in 1950. In 1954 there were 62,520 farms in South Dakota, covering 44,949,000 acres, and averaging 719.9 acres per farm. The raising of livestock provided the largest single source of income for the state, and South Dakota ranked third in the country in 1957 in the production of beef cows. Gross income from cattle and calves in 1956 totaled $199,951,000, while the farm value of sheep and lambs in 1957 was estimated at $19,040,000. In 1957 South Dakota was the nation's fourth-ranking producer of durum wheat and eighth in all wheat production. In that year, 1,978,000 acres of wheat were harvested, yielding 40,037,000 bu. (farm value, $79,244,000).



Also in 1957, South Dakota held second place in rye and flaxseed production, having raised 4,914,000 bu. of flaxseed and 3,927,000 bu. of rye. Hay production in 1957 amounted to 6,942,000 tons. Other important agricultural products included potatoes, poultry, sugar beets, and soybeans. In 1957 cash income from crops, livestock, and government payments totaled $578,590,000.

Wholesale and retail trade together form the second-largest employment sector, engaging 18 per cent of the state's labor force in 1950.

Manufacturing engaged only 5 per cent of the labor force in 1950. The largest industry of South Dakota is the processing of food products, especially meat packing. In 1954 the value added by manufacture in the food-products industry was $56,713,000, of which $35,194,000 was furnished by meat products. Other sizable industries include grain milling, especially of animal feeds; furniture-making; printing; and production of stone, clay, and glass products, and of fabricated metal products. In 1956 the total value added by manufacture amounted to $91,000,000. The state's labor force in 1950 was 242,149.

In 1957 South Dakota ranked 38th among the states in mineral production; its output, valued at $39,990,000, represented less than 1 per cent of total U. S. production. The principal minerals in order of importance were gold, sand and gravel, stone, and cement.

The state government estimated in a recent year that the tourist industry was now second only to the raising and processing of agricultural products as a source of income for South Dakota.

TRANSPORTATION AND COMMUNICATION

With bulky products to move to market, South Dakota would benefit by extensive water transportation, but, since its rivers are very shallow and tend to freeze over during much of the year, the state has come to depend heavily on railroad and highway transportation. A series of dams being built on the Missouri may increase its usefulness, however, in the near future.

The first railroad to operate in South Dakota was the Winona & St. Peter R.R., now a part of the Chicago & North Western Ry. Other major railroads include the Chicago, Burlington & Quincy R.R.; the Great Northern R.R.; and the Chicago, Milwaukee, St. Paul and Pacific R.R.. Railroad mileage totaled 3,916 m. in 1956. In the same year, South Dakota had 92,465 m. of roads, of which 47,741 m. were surfaced. All the major cities and towns of the state have airfields.

ANNUAL STATE EVENTS

Black Hills Passion Play	Mid-June to mid-September; Spearfish
Gold Discovery Days	Last week in July; Custer; marks anniversary of Custer expedition of 1874–75
Black Hills Roundup	July 3–5; Belle Fourche; rodeo
Days of '76	Early August; Deadwood; celebrates 1876 gold rush
State Fair	Second week in September; Huron
Corn Palace Festival	Last week in September; Mitchell

In 1957 South Dakota had 18 radio stations and seven television stations. The first newspaper published in South Dakota was the Sioux Falls *Dakota Democrat* (1859). Today's leading newspapers include the Sioux Falls *Argus-Leader* and the Rapid City *Journal.*

POPULATION

South Dakota has 68 counties. The state's 1950 urban population comprised 33.2 per cent of the total population; the rural population, 66.8 per cent. Between 1940 and 1950, the urban population rose by 36.7 per cent over that of 1940. The rural population declined by 10 per cent. South Dakota's population was estimated at 699,000 on July 1, 1958. In 1950 white persons numbered 628,504; of these, 597,737 were native born and 30,767 were foreign born. Nonwhite persons totaled 24,336; out of this group 23,344 were Indians, with the remainder including Negroes, Chinese, and Japanese. Population density in 1950 averaged 8.5 per sq. m.

The major religious faiths, in order of size, in 1950 were the Protestant and the Roman Catholic, with a very small Jewish group. The predominant Protestant bodies were the Evangelical Lutheran Church, The Methodist Church, and the Lutheran Church-Missouri Synod.

Chief Cities: Sioux Falls, in southeastern South Dakota, is the largest city in the state and a commercial center for the surrounding agricultural area.

Rapid City, in southwestern South Dakota, is the state's second-largest city, the gateway to the Black Hills resort area, and center of the state's mining and lumbering activity.

Aberdeen, in northeastern South Dakota, the state's third-largest city, is a railroad junction and a shipping point for agricultural products.

Pierre, in central South Dakota on the Missouri River, is the state capital and a shipping point for grain and cattle.

Famous Men and Women: Beadle, William H. H. (1838-1915), educator, who helped found South Dakota's school system and first teachers' colleges; he represents the state in the National Hall of Fame.

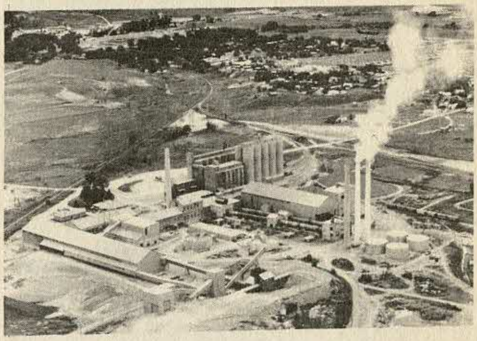
Clark, Charles Badger (1883-   ), cowboy poet ("Grass-grown Trails"), poet laureate of South Dakota.

Crazy Horse (1849?-77), chief of the Oglala Sioux, commander of the Indians at the battle of the Little Big Horn (1876).

Garland, Hamlin (1860-1940), Wisconsin-

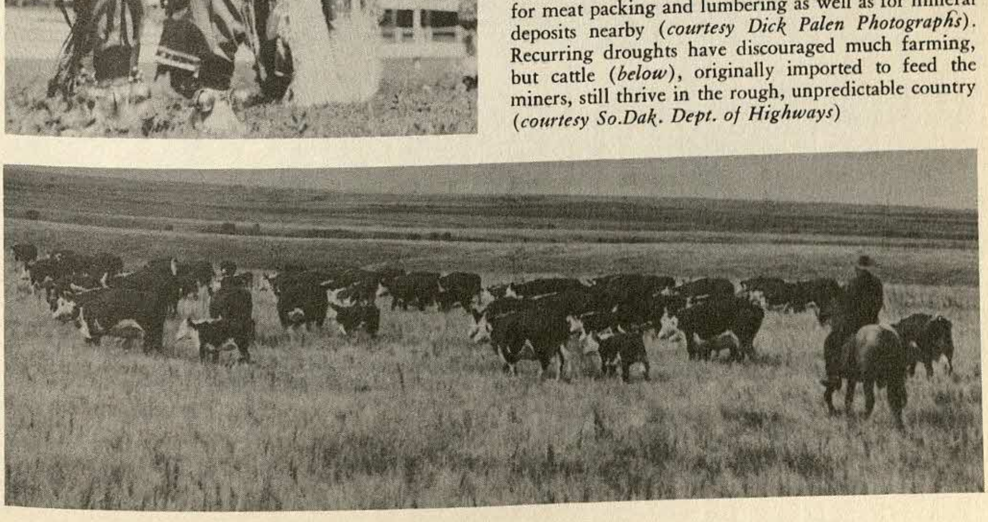
LOFTY SCENERY

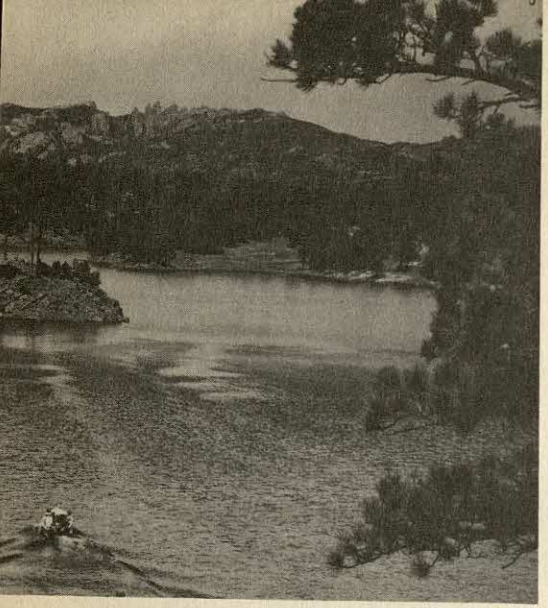
Mount Rushmore's portraits of U.S. Presidents (*above*) and the Big Bad Lands' weird formations (*right*) are outstanding sights



THE PAST MERGES WITH THE PRESENT

Treaties with the Sioux Indians opened the Dakota Territory to settlement, but the settlers' encroachment on Indian land sparked many bloody uprisings. Most of the state's 35,000 Indians now live on reservations (*courtesy So.Dak. Dept. of Highways*). Rapid City (*above*), in the striking Black Hills country, is known for its cement, concrete, and flour manufacturing and for meat packing and lumbering as well as for mineral deposits nearby (*courtesy Dick Palen Photographs*). Recurring droughts have discouraged much farming, but cattle (*below*), originally imported to feed the miners, still thrive in the rough, unpredictable country (*courtesy So.Dak. Dept. of Highways*)





South Dakota Dept. of Highways

CUSTER STATE PARK

Stockade Lake is a recreational favorite

born novelist who portrayed the homestead life of the Dakota prairies.

Hickok, James Butler (1837-76), Illinois-born scout and frontier peace officer, known as "Wild Bill" Hickok.

Lisa, Manuel (1772-1820), Louisiana-born trader; founder of the Missouri Fur Co.; introduced the first cattle to Dakota Territory.

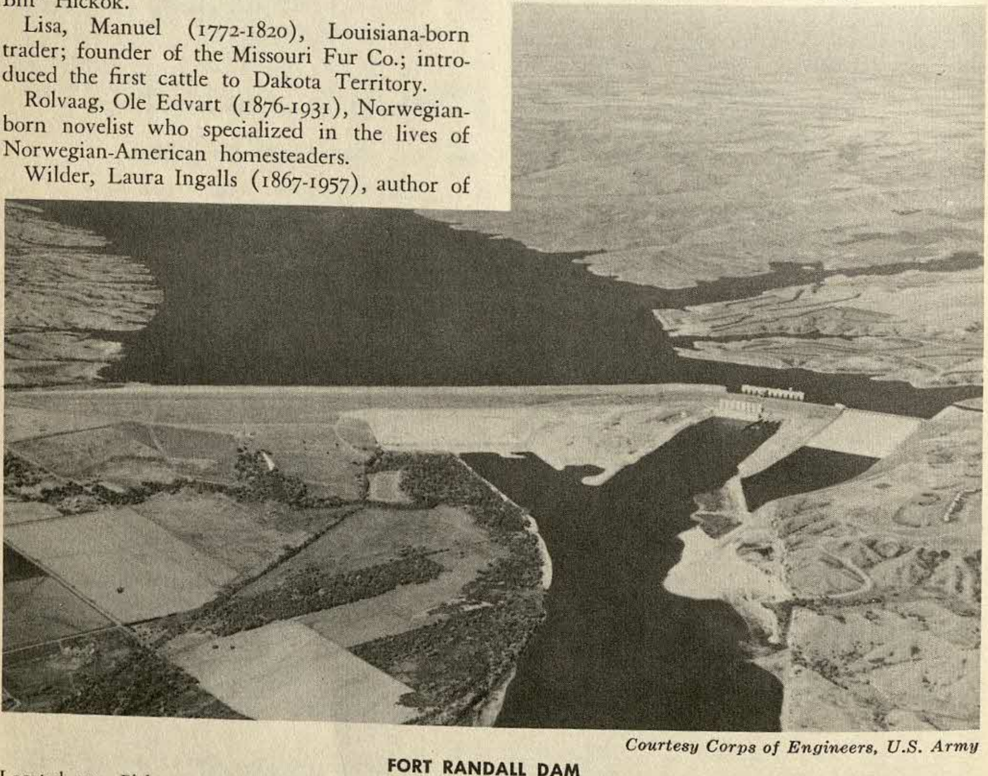
Rolvaag, Ole Edvart (1876-1931), Norwegian-born novelist who specialized in the lives of Norwegian-American homesteaders.

Wilder, Laura Ingalls (1867-1957), author of children's books about the early days in Dakota Territory.

EDUCATION

Education is free and compulsory for children between the ages of seven and 16. The state's public-school system was established in 1862. Public-school enrollment totaled 154,000 in 1958. The leading state-supported institutions of higher learning include the Univ. of South Dakota, Vermillion; South Dakota State Coll. of Agriculture and Mechanic Arts, Brookings; the South Dakota School of Mines, Rapid City; and state teachers' colleges at Aberdeen, Madison, Spearfish, and Springfield. Among the private and denominational institutions of higher learning are Augustana Coll. and Sioux Falls Coll., Sioux Falls; Dakota Wesleyan Univ., Mitchell; Huron Coll., Huron; and Mt. Marty Junior Coll. and Yankton Coll., Yankton.

Cultural institutions include a paleontological museum at the School of Mines, which features fossils recovered from the nearby Bad Lands; a historical museum at the state capitol, Pierre, containing exhibits relating to the early development of the state, including the lead plate buried by the Vérendrye brothers in 1743; and a small



Courtesy Corps of Engineers, U.S. Army

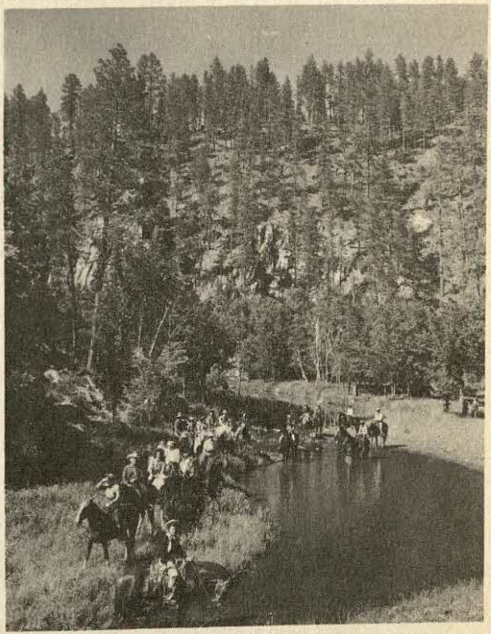
FORT RANDALL DAM

Located near Pickstown, S.D., it is one of the major dams in the Missouri River Basin project, providing flood control, power, and irrigation

Courtesy South Dakota Dept. of Highways

VIEWS OF SOUTH DAKOTA

Buffalo roam in Custer State Park (*above*). The Black Hills (*right*) of South Dakota offer many kinds of outdoor recreation



museum in Custer State Park, near Rapid City, with many relics of pioneer days and an unusually fine collection of Indian clothing and beadwork. Deadwood has preserved many mementos of the gold-rush days in its historical museum.

GOVERNMENT

South Dakota is governed under provisions of a constitution dating from 1889 and amended many times. The constitution gives executive power to a governor, lieutenant governor, secretary of state, attorney general, auditor, treasurer, superintendent of public instruction, and commissioner of public lands, each elected for a term of two years. There are also three railway commissioners elected for terms of six years. The legislature consists of a senate of 35 members and a house of representatives of 75 members, both houses serving for two years. The legislature convenes regularly in Pierre, the capital city, on the Tuesday after the first Monday in January of the odd-numbered years, for a session limited to 60 calendar days. The state supreme court has five justices, elected by districts for terms of six years. In addition there are 12 circuit courts, with justices serving for four years, as well as various county, municipal, and justice courts. South Dakota is represented in the U.S. Congress by two Senators and two Representatives.

HISTORY

The Vérendrye brothers, François and Louis Joseph, sons of Pierre Gaultier de Varennes, sieur de La Vérendrye who had explored the region of North Dakota a few years earlier, were the first white men definitely known to have entered South Dakota (1743). They were disappointed in their search for a route to the Pacific, but they buried a lead plate near the site of the present state capital, claiming the land for France. Amazingly, this plate was recovered by a group of schoolchildren 170 years later.

About 1780, Pierre Dorion, a French-Canadian, settled among the Sioux and became the first white resident of South Dakota. He was followed by Jean Baptiste Truteau, a teacher, who built the state's first house, called Pawnee House, in 1794. South Dakota became U.S. territory in 1803 as part of the Louisiana Purchase. The Lewis and Clark Expedition, sent out to explore

MAJOR RECREATIONAL AND HISTORIC FEATURES

Name and Type	*Size and Location*	*Points of Interest*
Wind Cave National Park (established 1905)	28,059 acres, near Hot Springs (U.S. 85 alt.; state 87)	Black Hills; limestone cavern with unique lacelike formations; buffalo herd, antelope, elk, and other wildlife
Badlands National Monument (established 1939)	111,530 acres, near Interior (U.S. 16 alt.; state 40)	Eroded cliffs and ravines; fossil beds
Jewel Cave National Monument (established 1908)	1,275 acres, near Custer (U.S. 16)	Limestone caverns connected by narrow passages; crystal formations
Mt. Rushmore National Memorial (established 1925)	1,278 acres, near Keystone (U.S. 16, 16 alt.)	Gigantic faces of Washington, Lincoln, Jefferson, and Theodore Roosevelt carved from granite mountainside
Black Hills National Forest (established 1897)	1,325,558 acres, in Lawrence, Meade, Penn, and Custer counties; the remainder in Wyoming (U.S. 14, 16, 85)	Spectacular canyons and waterfalls; crystal caves; gold-rush area, Homestake Mine; Harney Peak; Mt. Rushmore National Monumen t
Custer National Forest (established 1908)	77,826 acres, in Harding County; the remainder in Montana (U.S. 85)	Plateaus and peaks; lakes; glaciers; fossil beds
Custer State Park (established 1919)	72,000 acres, near Custer (U.S. 16 alt.; state 36, 87)	Scenic Black Hills country; largest U.S. buffalo herd; reproductions of pioneer stockade and houses; museum; camping, fishing, hiking
Farm Island State Park (established 1942)	1,800 acres, on an island in the Missouri River, 5 m. E. of Pierre (U.S. 83; state 34)	Swimming; camp sites in a heavily wooded area

the new land, passed through the state in 1804, following the Missouri River.

During the early 19th century, the main attraction of South Dakota for England, France, and the U.S. was the lucrative fur trade. Early in the century, John Jacob Astor's American Fur Co. competed with such other concerns as the Hudson's Bay Co. (British) and other American operators, but by the 1830's it had gained control of the trade along the Missouri River.

Farmers began to trickle in beginning in 1857, settling in southeastern South Dakota. Dakota Territory, including both North and South Dakota and parts of Montana, Nebraska, and Wyoming, was organized in 1861. The passing of the Homestead Act in 1862 and the end of the Civil War in 1865 further speeded settlement.

While on an exploration of the Dakota country in 1874, Horatio Ross, a member of George Armstrong Custer's party, panned some gold from a stream in the Black Hills. Although the Black Hills were in land reserved to the Sioux by the treaty of Laramie (1868), a mad rush of prospectors could not be prevented. At first the cavalry escorted the gold seekers out of the area, but others only took their places. Angered, the Sioux went on the warpath. Custer and his 7th Cavalry troop met their deaths at the hands of Sioux warriors led by Chief Crazy Horse at the battle of the Little Big Horn in nearby Montana. Other troops subdued the Sioux, however, and the Laramie treaty was soon forgotten. As thousands of prospectors streamed into the town of Deadwood, where the latest gold had been discovered, robbery, gambling, and general lawlessness became the order of the day.

Meanwhile, a more stable element was settling in South Dakota. Between 1870 and 1890 more than 250,000 were added to the population, as farmers, ranchers, and miners made new homes in the territory. The first church and school in South Dakota were built in 1860. In 1887 the people of South Dakota held an election in which it was decided to divide the Dakota Territory in two. (The parts now forming Montana, Wyoming, and Nebraska had been detached earlier.) Already having a written constitution, the new state of South Dakota was admitted to the Union by President Harrison on Nov. 2, 1889. In the following year, at Wounded Knee, the last Sioux uprising was crushed.

Mining dropped in importance as farming and ranching developed. By the time of World War I, the nation had come to depend heavily on South Dakota's bounty of wheat and beef. The state furnished 31,978 residents to the armed forces during the war, but despite this depletion of its own labor reserve South Dakota did its share in meeting the food needs of the war as its farmers put to plow much land that was not really suited to crop farming. The result was an amazing harvest for a while—then disaster. Years of drought and high winds stripped the land of its soil once the cover of prairie grass was gone. Thousands of farmers were ruined. Long before the depression of the 1930's overtook the rest of the country, the farmers of South Dakota were suffering hard times. Many costly lessons were learned about dry-land farming, however, and when World War II brought another appeal to the farmers and ranchers of the plains to produce more food, mechanization rather than increased acreage was relied upon to increase the yield. The state also furnished 67,323 men and women to the armed forces during the war. Since the war the government has embarked on an ambitious program to develop the resources of the Missouri Valley by means of a series of irrigation and power-dam projects at various points in South Dakota. Thus, over the last decade, agriculture has proved a profitable occupation for almost half the population, the total cash income from the raising of crops and livestock amounting to over $500,000,000 in 1957.

See also separate entries on most of the individuals and geographical and historical subjects mentioned in this article.

South Dakota, STATE UNIVERSITY OF, a coeducational state land-grant institution of higher learning at Vermillion, S.D., organized in its present form in 1882. Courses are offered in arts and sciences, business administration, education, fine arts, law, medicine, nursing, and graduate work. The library has more than 170,000 volumes. The annual student enrollment totals *ca.* 2,400, and there are approximately 150 members of the faculty. The physical plant is valued at *ca.* $10,000,000.

Southeast Asia Treaty Organization. See *Manila Treaty.*

Southern California (*sŭ*TH*'ĕrn ḳăl-ĭ-fôr'-nĭ-ạ*), UNIVERSITY OF, a nondenominational, coeducational, private institution of higher learning at Los Angeles, Calif., incorporated in 1880. It comprises the Coll. of Letters, Arts and Sciences, the graduate school, and schools of architecture, commerce, dentistry, education, engineering, international relations, law, library science, medicine, music, pharmacy, public administration, and social work. The facilities include radio and television studios and a nuclear physics laboratory. The library, noted for its collections of rare manuscripts, contains over 1,000,000 volumes. Student enrollment is *ca.* 18,000, and there are approximately 600 fulltime members of the faculty. The physical plant is valued at more than $30,000,000.

Southern Cross (*sŭTH'ĕrn ḳrŏs*), a group of stars in the Southern Hemisphere, including four stars of the first magnitude. Good views of it may be taken at the Tropic of Cancer, but its aspect is considerably better farther south. The four principal stars form a cross, two of them pointing directly east and west, while the upper and lower ones point to the South Pole. The Southern Cross is a less striking configuration than the Great Bear, but it is equally interesting from the circumstance that in the different seasons of the year the hour of the night is indicated by the position it assumes.

Southern Pines (*sŭTH'ĕrn pīnz*), a winter resort town of North Carolina, located 5 m. E. of another popular resort, Pinehurst, N.C. Tourist attractions include the mild climate, beautiful scenery, excellent hotels, and sports facilities. Population, 1940, 3,225; in 1950, 4,272.

Southey (*souTH'ĭ*), ROBERT, poet, biographer and historian, born in Bristol, England, Aug. 12, 1774; died at Greta Hall, near Keswick, England, Mar. 21, 1843; poet laureate of England from 1813 until his death. After four years at Westminster School, Southey was expelled in 1792 because of an article published in the school magazine. He entered Balliol Coll., Oxford, where he met Coleridge, whose wife's sister he later married. Spurred by their enthusiasm for the French Revolution, Coleridge, Southey, and a third brother-in-law, Lovell, developed a plan for a "Pantisocracy," a socialist Utopia which they hoped to establish near the present city of Harrisburg on the Susquehanna River in the U.S. Nothing came of the plan except a lifelong intimacy between Southey and Coleridge. Southey's early Jacobinism did not last.

After a period spent in Portugal, where he became interested in Portuguese literature and history, Southey returned to England, and began the study of law. In 1801, he established his residence with Coleridge at Keswick, in the lake region of England, where he became a neighbor and friend of Wordsworth. The three men have come to be known as the "lake poets" (*q.v.*).

As the laureateship indicates, Southey enjoyed a considerable reputation as a poet in his own day, although he was attacked violently in Byron's satire, "English Bards and Scotch Reviewers." Among his best poems are his ballads, the most interesting of which were written between 1796 and 1798, and his long romantic narratives, "Thalaba the Destroyer" (1801), and "The Curse of Kehama" (1810). In spite of the merit of these works, Southey now ranks higher as a writer of prose than as a writer of verse. As a prose-writer, his reputation rests chiefly upon his "Life of Nelson" and his "Life of John Wesley," and upon his letters.

South Milwaukee (*south mĭl-wạ'ḳē*), a city of Wisconsin, located 10 m. s. of Milwaukee on the shores of Lake Michigan. It is served by the Chicago & North Western R.R. Its principal products are excavating machinery, shoes, iron, steel and aluminum castings, insulating materials, garden tools, ornamental pottery, power and sail boats, electrical equipment, and leather goods. The city's public school system was an early pioneer in the vocational education movement. The first settler was Elihu Higgins, who built a dam and a sawmill in 1835. By 1840 there were enough settlers to organize a town, and in 1892 the city was incorporated. Population, 1950, 12,855.

South Mountain (*south moun'tĭn*), BATTLE OF, an engagement of the Civil War in the U.S., fought at South Mountain, near Sharpsburg, Md., on Sept. 14, 1862. Gen. Lee had invaded Maryland with a large army and was stationed near Turner's Gap with 18,000 men, when he was attacked by 28,000 Federals from McClellan's Army of the Potomac. After a stubborn resistance, the Confederates were compelled to retreat, losing 2,600 men, while the Federals lost 1,800. They fell back to Antietam (*q.v.*), where another battle was fought two days later.

South Orange (*south ôr′ĕnj*), a village in Essex County, New Jersey, 15 m. w. of New York City. It is on the Delaware, Lackawanna & Western R.R., and is connected by trolley and bus lines with other points. The site is on elevated ground partly represented in Orange Mt. and it is a popular residential suburb of Newark and New York City. South Orange is the seat of Seton Hall Univ. The few manufactures of the village consist of toilet preparations, plastic articles, bituminous products, and cement blocks. South Orange was first settled in 1670 and incorporated in 1869, remaining one of the state's few incorporated villages. Population, 1950, 15,230.

South Pole (*sowth pōl*). See *Antarctica; Polar Exploration; Pole.*

Southport (*sowth′pōrt*), a borough of England, in Lancashire, 18 m. N. of Liverpool. It is situated at the mouth of the Ribble Estuary, on the Irish Sea, and is popular as a watering place. Besides many public buildings and institutions, it has an art gallery, a public library, and winter gardens. The manufactures include clothing, earthenware, and machinery. Population, *ca.* 80,000.

South Portland (*pōrt′lạnd*), a city of Maine, in Cumberland County, on Casco Bay, opposite Portland. Situated at the mouth of the Fore River, it is connected with Portland by four bridges and motor bus lines and has communication by the Boston & Maine R.R. The manufactures include boats, furniture, clothing, snow plows, and marine hardware. It is the seat of a state school for boys, has a soldiers' monument, and is protected by government fortifications. Fort Preble (1808) commands a splendid view of Portland Harbor, and Fort Williams has the oldest lighthouse on the Maine coast. Formerly a part of Cape Elizabeth, the city was incorporated as South Portland in 1895. Population, 1940, 15,781; in 1950, 21,866.

South Sea (*south sē*), a popular term formerly applied to the Pacific Ocean. At present the meaning of the word is not clearly defined and includes such widely divergent parts of the Pacific as the China Sea, which lies off the southeast coast of Asia, and that part of the Pacific that extends from the Tropic of Capricorn to the Antarctic Ocean. It is also still used by some in its former sense, meaning the Pacific Ocean in general.

South Sea Bubble (*bŭb′l*), or SCHEME, a plan originated by Robert Harley, Earl of Oxford, in 1711, with the aim of securing the payment of the debt of England, which at that time aggregated $50,000,000. An amount equal to the debt was loaned to the government by a number of merchants, who were guaranteed an annual payment of 6 per cent interest. They were given a monopoly of the South Sea trade and the right to collect certain customs. The popular idea that enormous riches could be obtained in South America caused the stock to rise with remarkable rapidity until it reached $5,000, but a collapse came when the directors of the South Sea Co., operators of the scheme, liquidated their holdings at the high prices being offered. Panic spread among the stockholders and prices tumbled rapidly, ending in a disastrous crash that unseated English business and created a national scandal. It was found that fictitious stock to the amount of $6,300,000 had been authorized, of which about one-half had been sold. To reimburse the heavy losers, the government confiscated the property of the directors and remitted an amount equal to $35,000,000 due the government. Though this course provided a small measure of relief, it did not by any means repay those who had invested their money. See *Great Britain,* HISTORY.

South Shields (*south shēldz*). See *Shields.*

Sovereign (*sŏv′ẽr-ĭn*), a gold coin of Great Britain, the standard of value, representing the pound sterling. It is equivalent to 20 shillings, and was first coined in 1817, when it began to supersede the guinea. The sovereign weighs 123.274 grains troy. See also *Pound.*

Sovereignty (*sŏv′ẽr-ĭn-tĭ*), in government, the state of being sovereign, that is, having independent and supreme authority. The term is used in two different senses in relation to the power of a state or nation, these implying that internal as well as external sovereignty may be exercised. By *internal sovereignty* is meant the power of the state over its citizens, which is absolute and indivisible, that is, the state cannot be limited, except by its constitutions and laws, in exercising prerogatives over its citizens; and its authority cannot be divided so as to permit one or more other sovereigns to exercise the functions of government over its members. *External sovereignty* has reference to affairs with other nations, such as concluding treaties, declaring war, and negotiating peace.

Sovetsk (*sô-vĕtsḳ′*). See *Tilsit.*

Soviet (*sō-vĭ-ĕt′*), a Russian word meaning council, advice, or concord, formerly applied to local governing bodies but now used for territorial units. In current usage all Russia is divided into soviets, in the form of union republics, autonomous republics, provinces, or autonomous regions or territories. See also *Union of Soviet Socialist Republics.*

Soviet Russia (*sō-vĭ-ĕt′ rŭsh′ạ*). See *Russia; Union of Soviet Socialist Republics.*

Sow (*sou*), the female swine.

Sowing Machine (*sō′ĭng mạ-shēn′*). See *Seeding Machine.*

Sow Thistle (*sou thĭs′′l*), a genus of plants native to the Eastern Hemisphere, of which about 30 species have been described. The *common sow* *thistle* is 2 to 3 ft. high, bears small, yellow flowers, and is a branching plant. Another species, known as the *field sow thistle,* is an obnoxious weed in richly cultivated land. Several of these plants have been accidentally introduced into Canada and the U.S. with shipments of seeds.

Soybean (*soi'bēn*), an annual plant raised for food and forage. The genus has *ca.* 40 species, which grow in tropical and warm temperate regions. The soybean is a leguminous (*i.e.,* pod-producing) plant, with seeds which resemble the pea. The cultivated species (*Glycine Max*) grows 2-6 ft. tall, with three-leaflet leaves, narrow and somewhat oval in shape and 3-6 in. long. The pod is brown and hairy and has two to four seeds; it hangs on a very short stalk. Some of the plant's shoots are vinelike and climbing. Used in Asia, particularly, as human food, the soybean is one of the major crop plants of the U.S. It is used not only on the table and as animal food but as a basic material for plastics, varnishes, and industrial and edible oils.

Spaak (*späk*), PAUL-HENRI, public official, born Jan. 25, 1899, in Brussels, Belgium. He was educated at the Univ. of Brussels and subsequently practiced law in his native city. In 1932 he entered the national political scene as a Socialist deputy and soon became a cabinet member. Spaak, early in his political career, showed a statesmanlike attitude toward the problems his country and Western Europe were facing in the pre-World War II days, and he was then and later frequently called upon to serve as foreign minister (1936-38, 1940-48, 1954-57) and premier (1938-39, March 1946, 1947-49). He resigned the premiership in 1949 in protest against the return of Leopold III (*q.v.*). Spaak has supported efforts to form international organizations and in 1949 was elected president of the consultative assembly of the Council of Europe (*q.v.*). From 1957 to 1961 he was secretary general of N.A.T.O. (see *North Atlantic Treaty*). Subsequent to the strikes which broke out in Belgium in December 1960, he returned to politics and became vice premier and foreign minister in 1961.

Associated Press Photo

PAUL-HENRI SPAAK

Spaatz (*spätz*), CARL, Army officer, born in Boyertown, Pa., June 28, 1891. He was graduated from the U.S. Military Acad. in 1914 and thereafter spent his military career with U.S. aviation units. He became a major in the Aero Squadron (1917) and in World War I helped to set up an aviation instruction school. For a short period he was a member of a pursuit squadron. He studied at the Command and General Staff School, from which he was graduated in 1936. He later was given various air commands and, in 1940, became chief of the Plans Division of the Air Corps and, in 1941, chief of the air staff. His World War II service included the post of chief air adviser to Gen. Eisenhower in North Africa (1942). Commander in chief of the U.S. Strategic Air Force in Europe (1944), Spaatz held the same position in the campaign against Japan (1945). In 1945, too, he was promoted to general. After the war he was assigned to Washington, becoming commanding general of Army Air Forces (1946) and chief of staff of the Air Force (1947). He retired from active service in 1948 and accepted the position of contributing editor of *Newsweek.*

Space (*spās*), the concept which, with that of time, helps the human mind to conceive of the world. We must distinguish between the meaning of the word in daily language, in mathematics, and in philosophy.

In daily use, the term space means the distance between two objects, whether these objects exist in matter or in a vacuum. It also means extension in all directions, in all three dimensions. Finally, the word space is also sometimes used to characterize the location of an object, in which case it is almost identical with "place."

In mathematics, space means the mutual relationship of all three dimensions as the framework for all geometrical and stereometrical statements. Thus geometry (*q.v.*) and stereometry are actually sciences of the dimensional relations of objects.

In philosophy, the term space means the theoretical, abstract possibilities of all extension, finite as well as infinite. Philosophers have always been cognizant of the fact that space and time represent the fundamental concepts of our awareness of the world. Space has been defined and employed in many different ways. Various philosophers have developed their individual theories of space. In our time, the concept of space has decisively changed, essentially because of Einstein's (*q.v.*) deductions, originally only mathematical, which have, however, influenced our physical concept of space as well.

While Euclidean (*q.v.*) and Newtonian (*q.v.*) space had three dimensions—length, width, and height—we speak today of the fourth dimension of "space-time." Since it is an intrinsic quality of every object not only to extend in length, width, and height, but also to have duration, *i.e.,* to last in time, time is another dimension necessary to define a specific object. The projection of these four dimensions into a measurable system and the structure of the relationship of the individual objects—*i.e.,* a universe of four dimensions—can be calculated only in terms of higher mathematics far beyond the understanding of the layman, but the general concept of a four-dimensional universe has become part of the general consciousness of our time nonetheless.

Since time is seen now as just one dimension, the mathematical definition of an object includes now not only its place but possibly its motion, too (through space in time).

Space perception means the way in which we become aware of space. Like space's very existence, its perception by human beings has always been a philosophical problem, which has lately also become a concern of psychologists. Since the middle of the 18th century, various theories have been promoted, all of which boil down in essence to two: either the perception of space is an inborn, *a priori* capacity of the human mind which through experience can be developed, modified, and sharpened; or we have to learn about the existence of space by the experience of combining sensations conveyed to us through our different senses, *e.g.,* by looking at a building from outside and inside, walking around it and through it, by touching a large globe and looking at it, etc. Today most psychologists adhere to the second theory.

Space Travel. See *Astronautics.*

Spahi (*spä'hē*), a member of certain cavalry regiments in Algeria that have been part of the French army since 1831. These units are composed of native Algerians led by French officers. Troops of a similar nature, the sepoys, were organized by the British in India (see *Sepoy*). The Algerian cavalrymen wear long flowing Arab cloaks and carry sabers.

The origin of the word spahi is the Turkish or Persian *sipahi* (horseman).

Spain (*spān*), a country in southwestern Europe occupying about six-sevenths of the Iberian Peninsula and covering 191,860 sq. m. It is bounded on the N. by the Bay of Biscay and France, E. by the Mediterranean Sea, S. by the Mediterranean, the Strait of Gibraltar, and the Atlantic Ocean, and W. by Portugal and the Atlantic. It extends 540 m. from north to south, and 620 m. from east to west at the greatest width, in the northern part of the country. Spain proper also includes the Canary Islands (2,807 sq. m.), in the Atlantic Ocean off the west coast of Africa; the Balearic Islands (1,935 sq. m.), in the Mediterranean to the east of Spain, and Ceuta (5 sq. m.) and Melilla, old army stations in Morocco on the Strait of Gibralter. At the southernmost tip of the peninsula is the Rock of Gibralter, a British naval base guarding the entrance to the Mediterranean.

DESCRIPTION. The Iberian Peninsula stands at a mean altitude of 2,000 ft.—higher than any other European nation except Switzerland. Mountain ranges virtually enclose the Central Tableland, or Meseta Central, a great plateau, sloping toward the west and itself cut across from northeast to southwest by high mountains. The principal mountain chains are the Pyrenees, a natural barrier between Spain and France, and the Cantabrian range, both in the north; the Sierra de Gredos, the Sierra de Guadarrama, and the Montes de Toledo in the central part; and the Sierra Morena and the Sierra Nevada in the southern part. The Pyrenees constitute the highest range, including in Spain the Pico de Aneto, 11,160 ft. high, but the loftiest single peak in Spain is Mulahacen, 11,420 ft. high, in the Sierra Nevada. The Cantabrian Mts. reach elevations of 8,500 ft. and other ranges are 5,275 ft. high. Narrow valleys, drained by rapid streams, make many of the ranges difficult to traverse.

The drainage is chiefly toward the west, but some of the important rivers flow eastward into the Mediterranean. No streams flow directly north, owing to the fact that the Cantabrian Mts. form a watershed near the Bay of Biscay. The principal rivers flowing into the Mediterranean are the Ebro, the Júcar, and the Segura. The Guadalquivir flows southwest and discharges into the Atlantic. The Guadiana, the Tagus, and the Douro rise in Spain and flow through Portugal into the Atlantic, while the Miño forms part of the boundary with Portugal and discharges into the Atlantic on the northern frontier of that country. About 800 m. of the waterways are navigable, but only 300 m. can be used the entire year, owing to the marked effect of the dry season.

There is great variation in climate and rainfall. Somewhat less than one-half of Spain, in the north and west, is temperate and rainy; the rest of the territory, in the south and east, is unusually dry and has extremes of heat and cold. Much of the temperate area is sparsely populated and undeveloped because isolated by the almost impassable mountains. In the tableland the earth becomes parched and the rivers tend to dry up in the excessive heat of summer, while the winters are very cold and frequently made more bitter by the "Gallego," a north wind. In the center of the country, at Madrid, the mean tem-

Photo by Burton Holmes, courtesy Ewing Galloway, N. Y.

SPAIN. VIEW OF THE PROVINCES OF GRANADA

The Sierra Nevada can be seen in the background

perature is 55° F., but frost and snow are rare, and the summer heat frequently rises to 107°.

Mining. Spain has rich and diversified mineral deposits. Coal is mined in many sections, the largest coal center being Asturias, where the coal basin is estimated at about 800 sq. m. Other important basins are those of Leon, Palencia, and Burgos. Lignite also is found in a number of districts. The biggest metallurgical industry is production of steel and iron, centered in Bilbao, Asturias, Valencia, and Ponferrada. By and large, foreign capital has controlled Spain's mining enterprises, although not her industries connected with transformation of minerals. The country's mineral wealth includes a number of precious ores, particularly copper, lead, and mercury. Others, in smaller quantities, are zinc, tin, tungsten, silver, gold, bismuth, antimony, and sulfur. There are extensive salt-evaporating works at Valencia and in the Balearic Islands, and rich rock salt deposits in Catalonia and New Castile. The coal mines have never been exploited to the maximum, due in part to transport difficulties and a lag in industrialization. Thus, substantial imports of British coal have been necessary, but Spain's coal mining has been speeded up, and in 1940 only 140,000 tons were imported as compared with 2,600,000 tons in 1927.

Agriculture. Spain is primarily an agricultural country, despite the handicaps of great arid stretches and fallow highlands. A half-century ago agriculture began to advance rapidly, through the introduction of modern methods of irrigation and modern tools. Cultivated soil is estimated to comprise a little less than half the total area, with about the same amount of acreage devoted to pasture and woodlands. Figures compiled before the Civil War (1936-39) show that 33,000,000 acres of nonirrigated land and 1,500,000 acres of half-irrigated land were producing grains, primarily wheat, and 1,150,000 acres, almost all irrigated, were devoted to fruit and kitchen-garden produce. These outputs have been increased considerably through large-scale irrigation and advanced use of fertilizers. Cotton has become a major crop. The newly irrigated fields in Badajoz, scheduled to be in full production in 1960, are expected to yield some 350,000 bales of cotton annually. Important agricultural products also include potatoes, grapes, olives, sugar beets and cane, tobacco, cork oak, fruit, rice, licorice, and saffron. Extensive forests, not yet fully exploited, provide timber, as well as crude resin, resin oil, and turpentine.

To stimulate farming, the government extends loans and provides other inducements, such as crop insurance.

Manufactures. Industrially backward, Spain received some stimulus in this respect during World War I. However, the country never manufactured enough goods for her own needs, and losses during and since the Civil War (1936-39) made it necessary to import even more essentials than before. Through a series of trade agreements, the Spanish government has attempted to offset the disastrous effects of recent years. Catalonia, of which Barcelona is the leading city, has more manufacturing than any other province, mainly in the textile industry. Leather is manufactured extensively at Cordova, and there are large tobacco and cigar factories in Madrid, Seville, and Cordova. Mineral and chemical industries have an increasingly important place in the country's economy, under the government-controlled Na-

Courtesy Ewing Galloway, N. Y.

OLD SECTION OF TOLEDO, SPAIN

Streets such as this can still be found in almost every Spanish town

tional Syndicate of Chemical Industries, organized in 1939. Hydroelectric power, notably at the Douro plant on the Ebro River, is well developed. With Spain's long seacoast, a large income is drawn annually from the processing and canning of fish—cod, tunny, and sardines. Other manufactures include beet sugar, olive oil, glassware, shoes, porcelain, cutlery, hardware, and machinery.

COMMERCE. Traditionally, raw materials constitute Spain's chief exports, and manufactured articles her principal imports. Fruits, wine, and minerals are sold abroad, while lumber, foodstuffs, and machinery are imported. As a rule, imports exceed exports by about $150,000,000 annually. Government efforts to maintain a favorable balance of trade include a variety of measures, such as strong control of the importation of luxury articles. The government also holds control over foreign exchange. Although Great Britain was Spain's best customer for years, since 1947 Germany has dominated Spain's export trade and at the same time become the chief source of imports. Commercial treaties or agreements have been drawn up with many countries, and many commodities are exchanged with Japan, Poland, Sweden, and other countries through barter agreements. Generalissimo Franco, by his own decree, is the chief authority in directing foreign trade.

The country's merchant marine was rebuilt after the Civil War, and its gross tonnage is estimated at 2,000,000. In recent years, Spain has, in fact, built about 1.3 per cent of the gross tonnage under construction throughout the world. The peseta is the nation's currency; it is valued at U.S. $0.0240

TRANSPORTATION. Many roads and bridges, railways and communication systems were badly damaged or destroyed in Spain during the Civil War. A public works program was launched by the government in 1940, allocating 450,000,000 pesetas to reconstruction and improvement work. Over 50,000 m. of highways are now suitable for motor transport. With the railroads nationalized since 1941, somewhat more than 10,000 m. of railways are in use; about two-thirds are of standard gauge and the rest of narrow gauge. By 1942 the rolling stock in operation still amounted to less than that in use in 1936, but was being gradually rebuilt. Commercial air traffic has greatly increased in recent years. Telephone and telegraph systems, developed by foreign interests, were taken over by the Republican government during its existence, but were restored to private ownership under Franco. An estimated 1,500,000 m. of telephone wires and 90,000 m. of telegraph wires are in use.

GOVERNMENT. Following the abdication of King Alfonso XIII, the second Spanish Republic was proclaimed on Apr. 14, 1931. During the Civil War of 1936-39, the government was reconstituted several times, and following the victory of Franco's armies, an authoritarian state was organized in 1939 and reorganized in 1941 and 1942. The government is a single-party (*Falange* party) dictatorship with strong Fascist leanings under Generalissimo Francisco Franco Bahamonde, the *Caudillo* (leader). He is assisted by the advisory Council of the Realm and by a cabinet. The Cortes is the supreme legislative organ of the state. It is composed of 438 *Procuradores* (attorneys) who are either elected or hold office by virtue of their professions or their positions in the state—for example, cabinet ministers, mayors, and heads of universities and academies.

During Franco's rule, Spain is to be considered a monarchy without a king. In the event of his death or incapacitation a three-member regency council will direct the affairs of state and propose, by a two-thirds majority, a king or a regent whom the Cortes must accept by a two-thirds majority.

ARMED FORCES. A two-year period of military service is compulsory for all men between 21 and 39. The army consists of 10 army corps, in addition to commands in the Canary and Balearic Islands, the whole comprising 25 divisions. The navy consists of about 50 vessels. The air force is organized separately.

EDUCATION. In the first three decades of the 20th century, the rate of illiteracy decreased from about 60 per cent to 46 per cent. Following the establishment of the republic in 1931, the influence of the Church on education was sharply curtailed, but the authoritarian regime eliminated secular education. The country is divided into 12 educational districts, each centering about a university. The universities, in approximate order of enrollment, are located at Murcia, Madrid, Burgos, Granada, Saragossa, Barcelona, Seville, Santiago, Valladolid, Oviedo, Valencia, and Salamanca.

Roman Catholicism has been re-established as the official state religion. There are nine archbishoprics and 61 dioceses. The republic, before the victory of Gen. Franco, had separated church and state and granted a measure of religious liberty.

COLONIES. Spain has colonial possessions, all in Africa or islands off the African coast, which cover *ca.* 117,000 sq. m. and have a population (1958) of *ca.* 468,000. In 1956 Morocco gained independence from Spain and France. However, Spain retained Ifni, an enclave on Morocco's Atlantic coast, which was made a province in 1958; Ceuta; Melilla; and some islands off the northwestern coast. On Africa's west coast, she holds Spanish Sahara, including the territories of Río de Oro and Saguiet el Hamra. On the Gulf of Guinea, she holds Spanish Guinea and the islands of Fernando Po, Corisco, Annobón, and Elobey.

POPULATION. The density of population is *ca.* 135 to the square mile. Many former inhabitants have emigrated to Latin-American countries. Madrid is the capital and largest city, and has a population of 1,609,524 (est. 1950). Other cities of importance include Barcelona, Valencia, Seville, Malaga, Murcia, Cartagena, Saragossa, Granada, and Cadiz. Population, 1953 (est.), 28,528,000.

LANGUAGE, LITERATURE, AND ART. Spanish is a Romance language which sprang from the Latin of Roman conquerors. The designation *Castilian* may be used interchangeably with *Spanish*. The official language throughout the country today, it originated in the central part of Spain, and is distinct from three other regional languages: the Basque, of the Basque country in the northeast; the Gallegan, of Galicia, in the northwest, closely akin to Portuguese; and the Catalan, of Catalonia, at the Mediterranean end of the Pyrenees. Within these categories are various subgroupings, so that the tongue commonly spoken in Valencia, though like Catalan, has a separate grammar and vocabulary; and in three provinces where Basque is used informally, as many as 25 different dialects can be heard. Catalan has similarities to French, but also merges with another Spanish lingual subdivision—Aragonese—into Castilian. Since the 16th century Spain's literature has been written only in Castilian. Without the written word to keep them alive, the Basque, Catalan, and Gallegan languages are used today only among isolated residents of the respective regions.

Aside from the Latin writings of Spanish scholars under the Roman Empire, Spain's first great contribution to world literature was the "Poema del Cid" ("Poem of the Cid"), written about 1140, concerning the heroic exploits of Ruy Diaz de Bivar. The author of this epic poem, which is compared with the Roland saga, is not known. The Benedictine monk, Gonzalo de Berceo (1198-1264), wrote the earliest Spanish poetry. The first Spanish prose came from the pen of King Alfonso X (1221-84), known as Alfonso el Sabio (the Wise), who stimulated the use of Castilian, instead of the traditional Latin, as the language of culture. Early in the 14th century Juan Ruiz produced the greatly admired "El Libro de Buen Amor" ("The Book of True Love"), a satire in the form of lyrical poetry. Spanish literature reached the threshold of its Golden Age in the reign of Ferdinand and Isabella. The first printing of a book in Spanish took place in 1474; the first Spanish grammar was published. Among the unforgotten names of the period are Fernán Pérez de Guzmán (1378-1460), biographer and historian; Ingo Lopez de Mendoza, better known as Santillana (1398-1458) and Don Jorge Manrique (1440-78), poets; Garci Rodríguez de Montalva, who toward the end of the 15th century wrote the Spanish version of the

Courtesy Spanish State Tourist Dept.

SPANISH FOLK COSTUMES

famous medieval romance, "Amadis de Gaul" ("Amadis of Gaul"); and Fernando de Rojas (1475-1536), with his classic, "La Celestina" ("Celestina"), a novel in dialogue form.

Encouraged by Charles V, and after him by Philip II and Philip III, Spanish writers made this period known as the Golden Age in Spanish literature. The learning of Italian and other European scholars influenced the Spanish men of letters. Juan Boscán (1495-1542), a Catalan poet, adapted new Italian forms and measures; Garcilaso de la Vega (1501-36) produced notable sonnets and odes in the manner of Petrarch. In philosophy there were the humanists, Luis Vives (1492-1540) and Juan de Valdés (1501-41); in fiction, Mateo Alemán (1550-1609). The first comprehensive collection of Spanish ballads was published about 1543. Great mystics—perhaps the most famous, St. Teresa (1515-82) and Juan de la Cruz (1542-91)—wrote on religion. The drama early in the 17th century began to take first place in the literary output. The most widely acclaimed of Spanish writers, Miguel de Cervantes (1547-1616), published the first part of his celebrated "Don Quixote" in 1605, and it was presented in drama form for generations. Less well known outside Spain, but considered by some Cervantes' equal, was Lope de Vega (1562-1635), prolific writer of poetry and plays, and the inspiration for a number of dramatists who followed him. Pedro Calderón de la Barca (1600-81), known as Calderon, was an outstanding poet and playwright of the 17th century, and others somewhat less noteworthy were the poet Guillén de Castro (1569-1631), and the dramatists, Tirso de Molina (1571-1648) and Juan Ruiz de Alarcón (1581-1639).

The 18th century marked a period of decline in Spanish literature; the bulk of the writing that was done was a pale reflection of French letters, following the accession of the Bourbons to the Spanish throne. The writers of this time were important chiefly as forerunners of what was to develop into the Romantic Movement. The romanticists of the late 18th and early 19th centuries were typified by Martínez de la Rosa (1787-1862) and Ángel Saavedra (1791-1865), both playwrights strongly affected by their French and English contemporaries; and José de Espronceda (1808-42), called the Byron of Spain. Other popular exponents of this school were José Zorrilla (1817-93) and Gustavo Adolfo Bécquer (1836-70). Ramón de Campoamor (1817-1901) was considered one of the first poets of his time; José Echegaray (1832-1916), a playwright, won the Nobel Prize for literature in 1904.

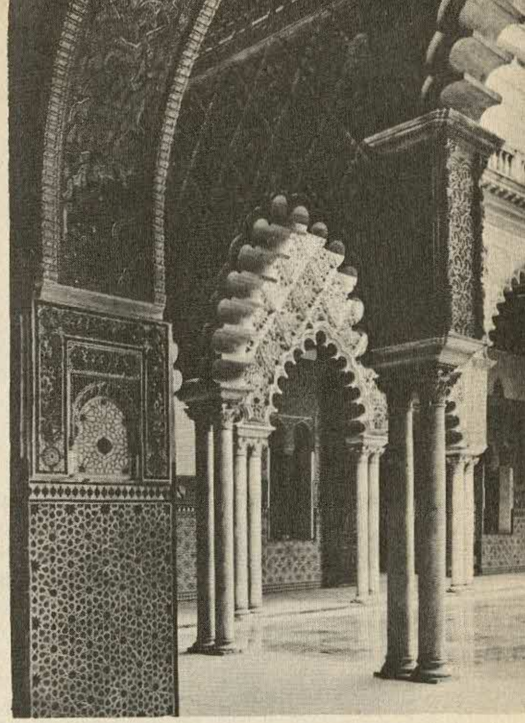
The art of the novel was reborn in the last half of the 19th century. Like writers in other parts of Europe, the Spanish novelists of the period were realists. A woman, Fernán Caballero (1796-1877), was a pioneer in this school, reviving for modern times the realistic approach of Cervantes and others. Pedro Antonio de Alarcón (1833-91), another of the period's best novelists, was famous for his book, *"El Sombrero de Tres Picos"* ("The Three-Cornered Hat"). More highly considered by critics were Juan Valera (1824-1905) and José María de Pereda (1833-1905), and especially, Pérez Galdós (1845-1920). The numerous novels of Emilia Pardo Bazán and Armando Palacio Valdés, of the same period, were also widely read. Spain's loss of the last vestiges of empire in 1898 acted as a stimulant on a group of idealistic young writers who thereafter were referred to as the "Generation of 1898," and whose influence still is felt. Their work was an expression of the Spanish people's growing political and social awareness. The leaders included Miguel de Unamuno (1864-1936), philosopher and novelist; José Martínez Ruiz (pen name, *Azorín;* born 1874), critic and essayist; the novelists, Pío Baroja (1872-1956), and Ramón del Valle-Inclán (1866-1936). Commanding a larger following in other countries were Vicente Blasco Ibánez (1867-1928), whose novels ("The Four Horsemen of the Apocalypse," "The Cathedral," etc.) were translated into English and many other languages, and Jacinto Benavente, playwright and Nobel Prize winner. Well-known contemporaries include Ramón Pérez de Ayala (born 1880), Salvador de Madariaga (born 1886), and José Ortega y Gasset (1883-1955). Many of the younger generation of Spain's journalists, poets, and fiction writers have been forced to live in exile since the civil war, frequently continuing their writing in foreign lands with which they have become identified.

In art and architecture Spain has been among the foremost countries of western civilization. The Moors left such architectural monuments as the Mezquita, at Cordova; the Giralda and the Alcazar, at Seville; and the Alhambra, at Granada. Structures such as the 12th-century Church of Santiago, at Compostela, the 13th-century cathedrals of Toledo, Burgos, and Leon, and the 15th-century cathedral of Seville are among the finest in Gothic architecture. The Plateresque style of architecture is exemplified in the hospitals at Toledo, Compostela, and Granada. The Spanish sculptors Gil de Siloe (15th century) and Alonso Berruguete (early 16th century) were masters in their time. Among the world's great artists are the Spanish painters, El Greco (1547-1614); José Ribera (1588-1652); Diego Velásquez (1599-1660); Francisco Goya (1746-1828); Ignacio Zuloaga (born 1870), and Pablo Picasso (born 1881).

History. The Spanish Peninsula was inhabited in ancient times by Iberians, Celts, and intermixtures of these two groupings; in addition, a less numerous people—the Basques—lived on both sides of the Pyrenees near the Bay of Biscay. Hundreds of years before the Christian era, Phoenicians and, somewhat later, Greeks settled in scattered colonies along the Mediterranean coast of Spain, then known as Iberia. The Carthaginians succeeded these earlier colonizers and acquired southern Spain as a province, but after the defeat of Hannibal were ousted from the peninsula by the Romans in the 3rd century B.C.

It took nearly 200 years for Rome to subdue the Iberians, until under Augustus Caesar in 19 B.C. their conquest was complete. The culture and customs of Spain received the permanent imprint of Rome, and the Spanish language itself was developed from the Latin of the conquerors. At the same time, Spain also contributed to the Roman Empire; such leaders as Marcus Aurelius and Theodosius were members of Spanish families, and the great 1st-century Roman writers, Seneca, Lucan, Martial, and Quintilian, all were Spanish-born. However, early in the 5th century, with the disintegration of the Roman Empire, a wave of barbarian invasions began in Spain. Preceded by Vandals, Alans, and Suevi, the Visigoths overran the country, to occupy it for the next 300 years. Under their sway the Christian religion, first in its Arian form, as practiced by the Gothic invaders, and at last in its Catholic form, as adopted earlier by the Spaniards under Roman rule, became the official state religion.

The military rule of the Visigoths was broken in 711 when Moslem conquerors—Arabs and Berbers from Africa—swept northward through the peninsula. At first Moslem Spain was subject to the caliph at Damascus, but dissension among the Arabian rulers ended in the establishment of a separate dynasty in Spain, with Cordova as the seat of government. The Ommayads (755-1031), first and most powerful of the three Moslem emirates in Spain, founded a prosperous society, in which art, science, and philosophy flourished. Only a few Spanish communities in isolated mountainous regions to the north, strengthened by refugees from captured territory, retained some independence from the Moors. In the 13th century the Spanish princes in the north began the reconquest of their country, pushing southward and forming new Christian states. These constantly struggled among themselves, but were united against the common enemy. The Moors, themselves disunited, lost ground, and their weakened government collapsed after the death of the autocratic grand vizier, Almanzor, in 1002. The Ommayad dynasty fell, and the two succeeding ruling groups—the Almoravides and the Almohades, both Berbers—were unable to stop the advancing forces of the Spanish states, which now included Aragon and Castile and the lesser principalities of Leon, Asturias, and Navarre. In 1212 the decisive battle of Las Navas de Tolosa, in the Sienna Morena, virtually destroyed the power of the Moors; one by one their citadels surrendered until in 1248 only Granada remained to them. Like the Romans, however, they had a lasting effect on the Spanish people, through widespread intermarriage, intermixture of culture and customs, and cultivation of new crops such as cotton, silk, oranges, and figs.



Courtesy Canadian Pacific Steamships

ALCAZAR IN SEVILLE

BATTLE BETWEEN THE ENGLISH FLEET AND THE SPANISH ARMADA IN 1588

Consolidating victory over the Moors, the kings of Castile and Aragon raised their respective states to supremacy and absorbed other smaller states or made them vassal. The first Cortes was called about 1250, but as a consultative rather than a legislative body. Late in the 15th century, under the combined rule of Queen Isabella of Castile and her husband, King Ferdinand of Aragon, Spain became in effect a unified kingdom in which only Navarre and Granada were yet to be incorporated. Various measures were taken to bolster the kingdom and weaken insubordinate nobles. The Holy Brotherhood (Hermandad), a national constabulary force, was organized to deprive the barons of their old judicial powers; grants of crown lands made by earlier sovereigns were revoked. One of the most drastic steps taken to strengthen the monarchy was invoked by the rulers in the name of religion: the Inquisition was put in effect in 1481. In 1492, Jews were ordered expelled from the country. In the same year Granada, the last Moslem stronghold, was taken by the Spanish armies. Also in that year Christopher Columbus discovered America, signaling the rise of Spain as a great world power.

After the death of Isabella in 1504 the throne went briefly to her daughter, Juana (the Mad); to Juana's husband, Philip of Hapsburg, son of Emperor Maximilian, and then to Ferdinand, as regent. In 1516, Charles, the son of Juana and Philip, became King Charles I of Spain. Already by inheritance Lord of The Netherlands, he was elected, in addition, Emperor Charles V of the Holy Roman Empire, in 1520. Bitter wars racked Spain and the rest of Europe under his reign; nevertheless, Spain's expansion went rapidly forward at the same time. Milan, Oran, Algiers, and Tripoli were annexed; Spanish explorers ranged up and down the Americas. By the middle of the 16th century Spain held Cuba, Mexico, Peru, parts of Paraguay and Colombia, Ecuador, Bolivia, and Chile. Spanish adventurers had explored Florida and had penetrated to the Mississippi, and in 1565 they occupied the Philippines. Under Emperor Charles V, and also under his son and successor, Philip II, religious and political despotism continued in force. Philip II was able to acquire Portugal for Spain (1580); but in his reign The Netherlands revolted and Spain's naval power shrank with the rout of her Invincible Armada, in 1588, at the hands of her expansionist rival, England. His son, Philip III, permitted a court favorite, the wasteful and corrupt Duke of Lerma, to guide the government. The greatest single mistake of this regime was expulsion of the Moriscos—Moors who had been Christianized under threat of exile after the fall of Granada. By 1609, when the Moriscos were ordered to leave, they had become a large and important segment of the population, and their loss contributed to Spain's approaching downfall. Under Philip IV, who came to the throne in 1621, Naples was lost; Holland finally gained her independence (1648); the English seized Jamaica (1655), beginning a long process whereby Spain eventually was to lose her New World empire; and Portugal broke away from Spanish rule. The decline of Spain continued under the next ruler, Charles II, who died without an heir in 1700. The War of the Spanish Succession followed (1711-13), ending with a series of treaties, notably the Treaty of Utrecht. Philip V, first of the Bourbon kings, ascended the throne, and Spain's remaining possessions in Europe were divided among Italy, Austria, and England. After Philip V came Ferdinand VI, in 1746, and Charles II, in 1759.

The period of these three kings was one of general prosperity, and in the reign of the last mentioned the Inquisition was broken by banishing the Jesuits in 1767. Charles IV succeeded to the throne in 1788, but abdicated in favor of Ferdinand VII in 1808. In the same year Joseph Napoleon was made king by his brother and governed until 1813, when Ferdinand VII was restored by an army of the European allies under Wellington. It was in this period, in 1800, that Spain ceded Louisiana to France.

While the wars against Napoleon were in progress the Spanish colonies of South America asserted their independence, Florida was sold to the U.S. in 1819, and a revolution in 1820 abolished the Inquisition and gave the country a more liberal constitution. Ferdinand, having abolished the Salic law in 1822, was succeeded by his daughter as Isabella II in 1833, under the regency of her mother. Don Carlos, a brother of Ferdinand and a pretender to the throne, raised a revolt, which was suppressed. The queen was declared of age in 1843, but her reign was disturbed by numerous revolts and party intrigues, causing her to flee from the country several times. She was finally exiled and Amadeus, second son of Victor Emmanuel of Italy, was elected king by the Cortes in 1870, but this sovereign resigned after a disturbed reign of three years, having been unable to cope with the continuing civil strife. In 1873, the Cortes proclaimed a republic which, however, was soon destroyed by the Royalists, clergy, and military who combined to restore the Bourbon dynasty in the person of Alfonso XII, son of the exiled Isabella.

The return of the monarchy brought little improvement; political corruption continued to characterize the machinery of government, weakening the hold of the country upon the remaining colonial possessions. In Cuba an insurrection, aften 10 years of sporadic fighting, was suppressed in 1878, promises of reform were forgotten, and revolution again broke out in 1895. Suppression of the revolt was complicated by an uprising in the Philippines, and later by the intervention of the U.S. The Spanish-American War ended in 1898 by stripping the once proud empire of most of her remaining possessions. Cuba secured her independence; the U.S. acquired Puerto Rico and the Philippine Islands, and in the following year Spain was obliged to sell her remaining Pacific islands to Germany.

In 1902, Alfonso XIII, posthumous son of Alfonso XII, ascended the throne. In the years following his father's death in 1885, the country had been under the regency of his mother, Maria Christina; manhood suffrage had been introduced, and Spain had entered upon an era of intense internal conflict. Although primarily agricultural, Spain had become industrialized in some areas, particularly in mining regions. The new industrial workers organized trade unions, and some adopted the political doctrines of socialism and syndicalism. In 1910, they succeeded in electing a liberal government opposed to the conservative, clerical, and land-owning cliques that previously had monopolized the instruments of government. A violent campaign against the new administration, however, soon forced it out of office, and the conservatives resumed control.

World War I accelerated the growth of social antagonism in Spain. While remaining neutral, the country became an important economic and commercial link between the warring powers. Spanish industry, and especially that of Barcelona in the Catalan province, expanded rapidly. The working class grew in numbers and strength and became an increasing threat to the monarchist and clerical groups. Widespread unrest led to considerable violence, and at the same time separatist movements in Catalonia and elsewhere added to the disorder.

Similar resistance movements started among the Moslems of Spanish Morocco. The Spanish government resorted to arms in 1918, but the Riffs, under Abd-el-Krim (*q.v.*), fought back. Despite censorship, news of African disasters spread through Spain, increasing the internal unrest. Alfonso XIII intervened in the military conduct of the war, superseding his generals and sending 13,000 Spanish troops to destruction. This move further angered the Spanish people, and their monarch thereupon tried to bolster his position by installing the military dictatorship of Primo de Rivera, in September 1923. Rivera suspended the constitution and introduced martial law. The Moroccan campaign continued, draining the treasury and dealing severe blows to Spain's prestige abroad. The issue was not settled until France intervened and defeated the Riffs in 1926. Discontent increased, spreading even to the army, where important units revolted in 1926 and 1929. Rivera resigned suddenly in January 1930 and fled to Paris, and in his place Alfonso appointed Gen. Berenguer. Spanish liberals, seeing little difference between the new dictator and the old, began to demand an end of the monarchy. The constitution was restored, minor reforms instituted, and finally provincial and municipal elections were held, in an attempt to pacify the people. On Apr. 12, 1931, a republican landslide vote was returned in the provinces, and the next day the government resigned. Niceto Alcalá Zamora (*q.v.*), a republican leader, demanded the king's abdication to avoid a revolution. Alfonso left the country, and a republic was proclaimed, with Zamora at the head of the provisional government.

However, the contending social forces were not reconciled. The royalists, large landowners who had benefited by the almost feudal system, as well as the church, which owned most of the land, united with the military leaders, who traditionally had formed a strong and self-sufficient clique within the Spanish framework, feared the increasing power and influence of the liberals, radicals, and trade unionists. Nevertheless, the infant republic might have survived had it not been born in the depth of a severe, worldwide depression in which economic hardship sharpened the struggle. Contributing to the widespread unrest was the anachronistic composition of social classes; the overwhelming bulk of the population was very poor, while a small minority was very rich. Between these economic extremes the comfortable buffer of middle-class society was conspicuously—and dangerously—absent.

The republic set about reorganizing the nation's social structure. A Cortes, the first in eight years, was elected by universal suffrage, and Zamora was elected president. Under a new constitution church and state were separated. Confiscation of church property was begun, and secular education was established. The republic granted autonomy to the Catalonians in 1932, and later to the Basques. The Cortes passed a much-needed agrarian reform law, whereby great tracts of land were expropriated for distribution among the small farmers.

The clergy organized a Catholic Action Party and advocated a policy of civil disobedience in defense of church prerogatives. As early as August 1932, a Royalist revolt broke out under the leadership of Gen. José Sanjurjo. The insurrection, quickly suppressed, resulted in legislation permitting the seizure of estates belonging to the rebels. Pressure from the right was resented by the left, which attempted to speed up the republican reforms by uprisings in January 1933 and October 1934. Meanwhile, some peasants came increasingly under the influence of Catholic leaders who combined with other conservative groups to wrest control of the government by constitutional means. The liberal parties then united to form the Popular Front.

In the elections of 1936 the Popular Front gained a clear majority in the legislature, and Manuel Azaña was elected president. The antirepublican forces reacted by gathering under the leadership of dissident army officers, to start an armed revolt on July 18, 1936. General Goded came from Majorca to direct the fighting, but was captured and shot; and Gen. Francisco Franco, former chief of staff demoted to the command of the Canary Island garrison, flew to Morocco to take command. He enlisted the aid of Fascist Italy and Nazi Germany, brought in thousands of Moorish troops, and established overwhelming military superiority over the poorly trained and inadequately equipped defenders of the republic, called Loyalists. The Spanish Civil War came to be recognized as the proving-ground for Fascist dreams of world dominion. Volunteers from other countries formed themselves into the International Brigade, marching beside the Loyalists. The Western democracies, in line with the "appeasement policy" (*q.v.*) then current, failed to support the Loyalists by devices such as the "non-intervention" policy (hypocritically agreed upon by Hitler and Mussolini as well) and the neutrality legislation in the U.S. Although Germany and Italy continued to place their resources at Franco's disposal, the Loyalists succeeded in holding off Franco's army for nearly three years. Finally, Barcelona fell in January 1939, Madrid surrendered on March 28, and Franco's regime was recognized by almost all foreign powers.

At the end of the Civil War a dictatorship was set up by Generalissimo Franco, called the *Caudillo* (Leader), as Chief of State. His party, the *Falange Española Tradicionalista,* enforced his rule to the effect that it controlled all branches of the government, the press and radio, as well as the labor syndicates which were substituted for trade unions. Governing by decree, Franco abrogated most of the important legislation of the republic, such as that providing for secular education, for land reforms, for autonomy of Catalonia, etc. Government expenditures rose abruptly, with a large proportion—in 1946 reputedly as much as 60 per cent—allocated to the armed forces. Taxes increased rapidly, and with inflationary tendencies unchecked since 1939, basic goods were available to only a small percentage of the consuming public.

Although Franco affirmed the neutrality of Spain in World War II, captured enemy documents proved that he had pledged his support to Hitler early in the war. After Germany invaded Russia, Franco sent his "Blue Division," nominally "volunteers," to fight on the Eastern front. Throughout the war Spain allegedly supplied Germany with raw materials and harbored German submarines in the Battle of the Atlantic. After the Allied victory Spain became a refuge for Nazis and Fascists. In 1946 Franco acceded to pressure from England and the U.S. and froze German companies which had been operating in Spain and also permitted the Allies to seize German assets in Spain, as reparation. Nazi refugees were allegedly repatriated from Spain, but Léon Degrelle, for instance, the Belgian quisling, was permitted to "disappear," thus eluding trial as a war criminal.

The defeat of Fascism elsewhere gave impetus to a rising antagonism toward the Franco government, inside and outside Spain, but with the exception of an occasional eye-witness account few actual reports on the conditions in Spain have come to the knowledge of the outside world. A government-in-exile, composed of former Loyalist leaders, was established in France, but the strength of the underground resistance within Spain can only be vaguely estimated. A number of small countries formally recognized the government-in-exile, while many other nations, including Soviet Russia, although not taking this step, refused to extend recognition to the Franco regime. A minority in the U.N. failed (late in 1946) in its demand for economic sanctions against Franco Spain and for a full break of diplomatic relations, although the Security Council's investigating committee had found that the Franco regime was a "potential menace" to world peace. In a gesture without any consequence, a majority of the U.N. members (including the U.S.) merely recalled their ambassadors and ministers from Madrid, with Spain still keeping her diplomatic representatives in the various foreign capitals.

The Franco government never tried to influence U.N. discussions by explanations or assurance and in 1950 the U.N. voted to let members resume diplomatic relations with Spain. The

U.S., Great Britain, and France soon did so; they were spurred to this action by Communist aggression in Korea. The U.S., seeking protection against any possible military aggression by Russia, signed a 20-year defense pact with Spain, in 1953, after some 18 months of negotiation. By its terms, Spain was to receive large amounts in grants and credits, and the U.S., in turn, was permitted the use of certain ports and air fields. Between 1953 and 1959 Spain received from the U.S. over $1,000,000,000 in various forms of aid; however, Spain's economy remained unstable. Spain was admitted (1955) to the U.N. and joined (1958) the Organization for European Economic Cooperation. Franco continued, after nearly a quarter of a century in power, to rule with an iron hand, and there seemed little hope that the monarchy would be restored or full civil liberties be extended during his lifetime.

Spalding (*spạl'dĭng*), ALBERT, violinist, born in Chicago, Ill., Aug. 15, 1888; died in New York City, May 26, 1953. After studying music in New York, Florence, and Paris, he made his concert debut in Paris in 1905. After a concert tour as a violin prodigy in Europe, in 1908 he appeared with the New York Symphony Orchestra under Walter Damrosch. During World War I, he served as a liaison officer in the Aviation Corps, and in World War II he served in the Office of War Information. He had an international reputation as one of the leading contemporary violin virtuosos. Spalding also composed some distinctive and popular music, chiefly for violin. His autobiography, "Rise to Follow," was published in 1943. Spalding was also the author of a novel, "A Fiddle, a Sword, and a Lady" (1953).

Spallanzani (*späl-län-tzä'nē*), LAZZARO, naturalist, born in Scandiano, Italy, Jan. 12, 1729; died in Pavia, Feb. 12, 1799. He studied at Reggio, and later under Laura Bassi, a famous woman professor of physics at the Univ. of Bologna. In 1754 he became professor of logic, metaphysics, and Greek at the Univ. of Reggio, in 1760 accepted a similar post at Modena, and in 1768 went to the Univ. of Pavia as professor of natural history. He thereafter devoted himself to experimental research, principally in physiology. He is important for his studies of the functions of respiration, of digestion, of the circulation of the blood, and of reproductive processes; he was a pioneer in the theory of artificial insemination. His great work is "Animal and Vegetable Physiology," originally published in Italian in 1780.

Spandau (*shpän'dou*), a former town of northeastern Germany, now a suburb of Berlin. It includes the Siemensstadt section, so called from the huge Siemens and Halske factories. Since World War II Spandau has been part of the British sector of Berlin; it contains the old fortress in which prominent Nazi war criminals are imprisoned. Population, 1950, 166,161.

Spaniel (*spăn'yĕl*), an extensive breed of dogs, distinguished by large, drooping ears, an affectionate disposition, and long, silky hair. The cocker spaniel (*q.v.*) has risen to such popularity that it is now one of the most common of all American household pets. See also *Dog*.

Spanish Africa (*spăn'ĭsh ăf'rĭ-ḳạ*). See *Spain:* COLONIES.

Spanish-American War (*spăn'ĭsh-ȧ-mĕr'ĭ-ḳạn wôr*), an armed conflict between Spain and the U.S., brought about in 1898 through the failure of Spain to maintain a stable government in Cuba. Unrest had disturbed the island for nearly 50 years, and American citizens who had invested in Cuba found that Spain was both unwilling and unable to protect their rights. A condition of war existed in Cuba from 1868 to 1878, known as the *Ten Years' War,* followed by a brief period of peace. The Cubans rebelled in 1895 and sought to establish an independent government, but they were repressed with unusual cruelty and severity. Secretary of State Olney, in 1896, represented the interests of American commerce to the authorities in Spain, and President Cleveland pointed out that the U.S. should consider the interests of the island from the standpoint of higher obligations than those due to Spain. Congress appropriated $50,000 for the relief of American citizens in Cuba in 1897.

Early in 1898 the U.S. dispatched the battleship *Maine* to the harbor of Havana to protect American interests. The ship was destroyed by an explosion on Feb. 15, 1898, and public demand for war, inflamed by lurid newspaper stories, was irresistible to Congress, although an American commission reported in March that the *Maine* had been destroyed by a submarine mine and that it was impossible to place the blame upon Spain. President McKinley in a message to Congress (April 11), recommending intervention, failed to state that the Spanish government had assured him the previous day of their earnest efforts to maintain peace. Accordingly, the Congress, on April 19, declared that "the people of Cuba are and of right ought to be free and independent." The President signed the resolution the next day. Spain, learning (April 21) of the stand taken by the U.S., asserted that this meant war and that the diplomatic relations between the two nations were at an end. On April 24 Spain declared war, and the following day Congress declared that war had existed since April 21. The declaration of war stated that Spain must relinquish her authority and government in Cuba and authorized the President to use the army and navy to accomplish these goals.

Courtesy Brown Bros., N. Y.

SPANISH-AMERICAN WAR
During the Battle of San Juan Hill

Spain had a force of about 80,000 men in Cuba, and her fleets were at the Cape Verde Islands off Portugal and in the Philippines. The U.S. rapidly mobilized 200,000 volunteers, a first call having been made on April 23 and a second in May. Camps of instruction were established near Tampa and Chickamauga, and the naval forces were utilized to blockade the ports of Cuba. Commodore George Dewey, on April 30, destroyed or sank the entire Spanish fleet at Manila Bay with total American casualties of seven wounded men. General Merritt was dispatched to the Philippines with troops to penetrate the islands. In the meantime, the Spanish Admiral Cervera had arrived from the Cape Verde Islands with his fleet and had entered the harbor of Santiago, Cuba. Admiral Richmond Pearson Hobson made his daring attempt to sink the collier *Merrimac* at the narrow entrance to the harbor at this time, hoping to bottle up Cervera's fleet inside, but the attempt was unsuccessful. Nevertheless, Cervera was effectively shut in when a battleship was placed at the mouth of the harbor.

Meanwhile, Gen. Shafter had sailed from Tampa, Fla., with transports carrying about 17,000 troops. He arrived off Santiago on June 19 and by the end of the month was ready to attempt capture of the harbor and the fleet, aided by about 5,000 Cuban troops under Gen. Garcia. The Spaniards offered resistance at Las Guasimas, where the Americans under Gen. Wheeler lost 68 men, and at El Caney and San Juan Hill, both of which were taken by the Americans on July 1. The Roughriders (*q.v.*), an outfit in which T. Roosevelt (*q.v.*) was serving, played a large part in the battle of San Juan Hill. Cervera, realizing that Americans could now place guns on the hills overlooking the harbor, attempted to escape. The Spanish fleet was immediately pursued by every ship in the American squadron, and in the course of a few hours the six Spanish vessels were destroyed or captured. About 350 Spaniards were killed in the battle, Cervera and 1,700 men and officers were captured, while only one American was killed, and ten were wounded. The siege of Santiago continued until July 15, when Gen. Toral surrendered. General Miles, on July 25, landed at Guanica, in Puerto Rico, and on July 28, having met almost no resistance, took possession of the island in the name of the U.S.

General Merritt, meanwhile, had arrived, July 25, in Manila, where he assumed command of the American troops there. On Aug. 13 he captured the city, taking about 11,000 prisoners.

The war was concluded by the Treaty of Paris, negotiated at Paris, France, on Dec. 10, 1898. By its terms Spain surrendered Guam, the Philippines, and Puerto Rico to the U.S. in return for $20,000,000 but retained certain commercial privileges in the Philippines. At the same time Spain relinquished all claim to Cuba. The expense of the war to the U.S. is estimated at $165,000,000, up to Oct. 31, 1908. American loss of life for the entire war was under 3,000, but all but a few hundred of these died from disease. This excessive loss of life caused the suspicion that the camps were mismanaged, but an investigation showed that it was carelessness in sanitation on the part of the soldiers and inadequate preparation for a tropical climate on the part of the War Dept., rather than actual mismanagement, that caused the casualties.

Spanish Succession (*spăn'ĭsh sŭk-sĕsh'ŭn*), WAR OF THE; waged (1701-13) by Louis XIV of France in an effort to gain for France the control of Spain. The war began in 1701 when the Spanish king, Charles II, made a will in which Philip of Anjou, the grandson of Louis, was named as his successor. Immediately a Grand Alliance, made up of England, Holland, Austria, and several German electors, joined later by Portugal and Savoy, was formed; this alliance demanded that the crown, instead of going to Philip, should go to Archduke Charles, grandson of Emperor Leopold.

The major part of the fighting took place in the Netherlands, in southern Germany, in Italy, and in Spain, with the Allies winning battle after battle, notably at Blenheim (1704). However, in quick succession three events occurred which turned the tide of battle. Louis aroused the French to such a pitch that defeat was temporarily staved off; the English government changed ministries, and the change brought with it a rapid cooling in the war feeling; and Charles was made Emperor of Austria, thereby making him an undesirable candidate for the Spanish throne. Under these conditions the Treaty of Utrecht was signed in 1713.

This treaty provided that: (1) Philip V, the grandson of Louis, should become King of Spain on the provision that the crowns of France and Spain never unite; (2) the Austrian Hapsburgs should receive the Belgian Netherlands, Naples, Sardinia, and Milan; (3) England should receive Newfoundland, Nova Scotia, and Hudson Bay from France, and Gibraltar and Minorca from Spain. The war and the subsequent treaty thus brought to an end the rivalry between the Bourbons of France and the Hapsburgs of Spain. The American phase of the war is known as Queen Anne's War. See *French and Indian Wars.*

Spark (*spärk*), the passage of electricity through the atmosphere as a result of a high potential difference between two electrical conductors. The spark is accompanied by sharp noises and the emission of light. Frequently an acrid odor results from sparking as a result of the production of ozone out of oxygen in the atmosphere. The potential differences required to produce sparking in the air varies with the length of the spark, but averages 30,000 volts per inch of spark between spherical conductors 1 in. in diameter. Lightning (*q.v.*) is a sparking process involving passage of a very intense spark between an electrically charged cloud and the earth or another cloud.

Sparkman (*spärk-măn*), JOHN JACKSON, Senator (D., Ala.), born in Hartselle, Ala., Dec. 20, 1899. He was admitted to the bar in 1925 and practiced law. He was elected to Congress in 1937 and to the Senate in 1946. In 1950 he was a U.S. delegate to the General Assembly session of the U.N. In Congress he generally supported the Roosevelt and Truman administrations, but opposed the latter's civil-rights bills. In 1952 he was nominated for Vice President by the Democratic party, which, however, lost the election.

Sparks (*spärks*), JARED, historian and biographer, born in Willington, Conn., May 10, 1789; died in Cambridge, Mass., Mar. 14, 1866. After being graduated from Harvard Univ., in 1816, he became minister of a Unitarian church in Baltimore, and in 1821 was made chaplain of the U.S. House of Representatives. He was editor of the *North American Review* from 1824 to 1831 and went to Europe within that period to study colonial archives. In 1839 he became professor of history at Harvard Univ. His writings include "Life of Gouverneur Morris" and "Library of American Biography." He edited "Diplomatic Correspondence of the American Revolution" and other works.

Sparrow (*spăr'ō*), a genus of birds of the finch family, which are widely distributed in North America and Europe. The American sparrows include several species of small birds, among them the *song sparrow, chipping sparrow, field sparrow,* and *fox sparrow.* The color is mostly brown with white and black markings, and they are noted for being tame and greedy. The *house sparrow* is native to Europe, but was introduced in Canada and the U.S. in 1862. Since then these birds have spread over most of North America, owing to the rapidity with which they increase. In some localities a small sum is paid for their destruction, and in several instances legislatures have appropriated funds for that purpose. They are noted for feeding greedily upon caterpillars and other insects, but frequently prove a pest to the market and fruit gardener. In the winter season they congregate in cities and about buildings, both for shelter and food. They nest on the ground and in bushes, usually laying from four to six eggs with spots of dark brown.

Sparrow Hawk (*spăr'ō hąk*), the common name of several small falcons. They are about 12 in. long with a wingspread of 20 in. The wings are short and they have a curved bill and long, slender legs. The plumage is of a brownish color, usually diversified by darker spots, and the male has dark brown shades on the upper side of the head. Both sexes incubate. These birds are bold and skillful in attacking their prey, which consists of sparrows, pigeons, lizards, mice, young chickens, and insects. The *American sparrow hawk* is a handsome bird and is allied to the kestrel. Several species of sparrow hawks are native to Europe and Australia.

Spars (*spärz*), the name given to the Women's Reserve of the U.S. Coast Guard—derived from

SPARROW HAWKS

Courtesy U. S. Forest Service

the initials of the Coast Guard motto, *"Semper Paratus*—Always Ready"—authorized as a wartime emergency measure by Congress, on Nov. 23, 1942. The Coast Guard first estimated that it could use 3,000 enlisted women and 300 officers in its wartime program. However, as more and more men were needed for urgent sea duty and women proved themselves capable of filling essential billets in shore establishments, whole areas of work were taken over by women reservists. By the end of the war the Spars numbered 10,000 enlisted women and 1,000 officers. At the peak of Coast Guard strength, one out of every 15 enlisted persons was a woman and one out of every 12 officers was a Spar officer, the highest ratio of women to men utilized by any service.

The largest numbers of Spars were stationed at district Coast Guard offices throughout the country, but as soon as women of the naval services were permitted to serve outside the continental U.S. relatively large contingents volunteered and were assigned to Hawaii and Alaska.

Enlisted Spars served in 30 different Coast Guard ratings, and many achieved the distinction of becoming first class and chief petty officers. The greatest proportions of women were employed in the ratings of yeoman and storekeeper, thus making use of their civilian skills as stenographers, secretaries, and bookkeepers. Large numbers were trained as radiomen and served with distinction in the communications service. Still others served as cooks, bakers, pharmacist's mates, printers, teachers, switchboard operators, drivers of motor vehicles, parachute riggers, and in other special services.

With the cessation of hostilities, a demobilization program based on critical point scores was set up for Spars. All Spars were demobilized by June 30, 1946.

Sparta (*spär′tȧ*), or LACEDAEMON, a powerful city of ancient Greece, capital of Laconia in the Peleponnesus, 27 m. inland from the Mediterranean port of Gythium. In ancient times the city was divided into several quarters, or villages, the most important of which was the Pitané in which were situated the senate house and public offices, the theater, the "choros" (place for dances), and the temples.

According to mythology, Sparta was founded by Lacedaemon, son of Zeus and Taygete, who married Sparta, daughter of Eurotas. The kingdoms of Sparta and Argos (to which Sparta was previously subject) were joined by the marriage of Orestes, ruler of Argos, and Hermione, daughter of Menelaus who ruled over Sparta. During the Dorian migration, about 80 years after the Trojan War, Sparta was completely subjugated by the Dorians. The first Spartan (Dorian) rulers were Eurysthenes and Procles, twin sons of Aristodemus; thereafter, there was a dual kingship. The population was divided into three classes: the Spartan, or Dorian, ruling class; the Perioeci, or old Achaean inhabitants, who were free but had no political or civil rights; and the Helots, who were also old Achaean inhabitants but bound to the land as slaves. Neither the Perioeci nor the Helots ranked as citizens.

The period of Spartan greatness began with Lycurgus, a member of the royal family who drafted Sparta's constitution (*ca.* 825 B.C.). Under this constitution the real power lay with the senate, a body of 28 elders elected for their excellent citizenship rather than because of birth or property. The two kings also voted in the senate. A popular assembly composed of all Spartan citizens of high character and over 30 years of age met regularly to vote on the legislation of the senate and delegate administrative authority to their representatives, the ephors.

The source of all wealth was considered to be land, which belonged to the state, and citizens were forbidden to use coinage of precious metals. Spartan citizens existed for the state and shared in holding the land, although they themselves were not permitted to engage in trade, industry, or agriculture. The Spartan citizen was a warrior and trained to obedience, endurance, and military prowess. The life and education of both men and women were carefully supervised from the age of seven years. If babies were found, at birth, to be weak or deformed, they were left to die. Men were trained in athletic games and military exercises; women learned milder exercises and dancing, and to be good wives and mothers. There was no emphasis on intellectual pursuits.

Since the Spartan citizens were fundamentally soldiers and rulers, menial labor and cultivation of the land, as well as commercial activities, were left to the Perioeci and the Helots. The Perioeci paid rent to the state for their land; the Helots were bound to lands held by the ruling class and paid rent to their masters.

Through military power, Sparta gradually came to dominate all the cities of the Peleponnesus. She conquered the peoples of Aegys, Amyclae, Pharis, Geronthrae, Helos, Cythera, Messenia, Tegea, Argos, and Cynuria, becoming recognized as the chief city-state of Greece. At the outbreak of the Persian wars in 500 B.C., Sparta did not immediately come to the aid of the other Greek city-states and failed to arrive in time to take part in the great Battle of Marathon (490 B.C.) outside Athens. In 480 B.C., however, the Spartan king Leonidas with 300 Spartans and some 2,000 other Greek soldiers conducted a heroic defense of the celebrated Pass of Thermopylae. Xerxes' tremendous opposing force is said to have numbered some 1,500,000. Although this was a disaster, the Greek forces commanded by the Spartan Pausanias gained an important victory at Platea in the following year.

The subsequent treachery of Pausanias caused the other Greek states to ally themselves with Athens, whose citizens were famed for both bravery and patriotism. The increasing ascendancy of Athens led to the Peloponnesian War (431-404 B.C.), during which Athens was captured and Sparta temporarily regained her position.

But after 387 B.C., when Sparta concluded the ignominious peace of Antalcidas (by which the Persians received the Greek cities of Asia Minor and the Island of Cyprus), the other Greek states turned against her. She was several times invaded by their forces, suffering defeat at the Battle of Leuctra in 371 B.C. and losing Messenia in 369 B.C. She was further devastated after Philip of Macedon conquered most of Greece (338 B.C.). The Spartans quarreled among themselves, and gradually their government became exceedingly corrupt. The number of citizens decreased from 8,000 in 400 B.C. to 700 in 244 B.C. The Spartan king, Cleomenes III, succeeded in wresting the power from the ephors in 225 B.C. and after admitting some of the Perioeci to citizenship, redistributed the land. A few years later, however, he was defeated by the Acheans and Antigonus Doson, King of Macedonia, at the decisive Battle of Sellasia (221 B.C.). Sparta was captured and forced to join the Achaean League, a confederation of Peloponnesian cities. In 146 B.C., Sparta and the rest of Greece were conquered by Rome. Ancient Sparta was almost completely destroyed by barbarian invasions during the first centuries of the Christian era.

In 1834, after the Greek War of Independence, the modern city of Sparta was built on the ancient site according to designs made by the German Gen. A.G. Jockmus, Baron de Cotignota, who had participated in this war. It is now a town of 7,000 inhabitants.

Spartacus (*spär′tȧ-ķŭs*), Roman gladiator, born in Thrace in the latter part of the 1st century B.C. He adopted the occupation of his father, who was a shepherd, but he was taken captive by the Romans and became a trainer of gladiators at Capua. In this gladiatorial school were a large number of Gauls, Thracians, and Germans, who had been taken captive and enslaved, and these formed a conspiracy to undertake an insurrection against the Roman government. After escaping captivity, they enlisted many slaves and a large number of peasants, forming an army of 75,000 men under command of Spartacus. He succeeded in conquering several cities of Southern Italy and defeated two Roman armies with considerable loss to the latter. However, after he and his followers gained their liberty, Spartacus desired that his soldiers should return to their homes, but they preferred to march against the Roman capital and were met by an army under Licinius Crassus. A decisive battle occurred near the source of the Silarus River, in which the insurrectionists were defeated. Spartacus was slain in the contest. This uprising is known as the *Servile War* and occurred in the period included between 73 and 71 B.C.

Spartanburg (*spär′tạn-bûrg*), county seat of Spartanburg County, South Carolina, in the northwestern part of the state, on the Southern and the Piedmont & Northern R.R.'s. The surrounding country produces fruits, tobacco, and cereals and has deposits of iron, gold, and limestone. It is the state's chief cotton-manufacturing center, and produces clothing, earthenware, and machinery. Spartanburg is the seat of Wofford Coll., Converse Coll., and a junior college. Nearby is the state school for the deaf and blind. Although settlements had been made in the area since 1761, Spartanburg was not founded until 1785 and was incorporated in 1831. Population, 1940, 32,249; in 1950, 36,795.

Spasm (*spăzm*), in medicine, a sudden violent contraction of the muscles such as that caused by a cramp, sometimes also called a convulsion. There are many reasons for the occurrence of spasms, *e.g.,* fatigue, hysteria, epilepsy, infection by tetanus, occupational exhaustion of certain parts of the body, etc.

Spavin (*spăv′ĭn*), a disease of the hock-joint (joint on the hind leg between the knee and the fetlock of a horse). It corresponds to the ankle joint in man. *Blood spavin* is a soft swelling along the inside of the hock-joint due to dilatation of a vein located there. *Bog spavin* is an encysted gelatinous tumor on the inside of the hock-joint of a horse, usually due to injury or strain. *Bone spavin* is a disease of the bony structure of the hock-joint, caused by injury, and resulting in local enlargement and stiffness of the joint due to increased bony deposition about the joint. Most spavin cases may be cured with proper veterinary care and rest for the horse, but there is usually permanent stiffness from bone spavin.

Spawn (*spạn*), the eggs of mollusks, fishes, crustaceans, frogs, and other species of animals. The eggs or ova are extruded in a mass by the females and, after being fertilized by the male, give rise to new life in the same species. This applies only to some forms of oviparous animals, while in others the fertilization by the male is effected before the eggs are extruded. In ovoviviparous animals copulation takes place between the sexes and the eggs are hatched in the body, as in some reptiles and fishes. The eggs deposited in the spawn, as in the fishes, often reach several millions.

Speaker (*spēķ′ẽr*), the presiding officer of a deliberative assembly, whose duty is to preserve order and see that the rules of debate are enforced. The presiding officer of the British House of Lords is the lord chancellor, whose appointment is derived from the sovereign, but the House of Commons elects its own speaker, subject to the approval of the crown. The latter can only speak or vote in committee, except in the case of an equality of votes, when he gives the deciding vote. He holds office until the dissolution of the Parliament of which he was elected speaker. Since the office is nonpolitical, the speaker may remain during opposing and successive administrations, and is usually rewarded with a peerage on retiring.

In the U.S., the speakership of the House of Representatives (*q.v.*) is a political office and the speaker owes his election principally to the majority party but is, of course, elected by the House itself. He is the presiding officer of the House; decides questions of order; appoints chairmen of the committees of the whole; signs acts, warrants, subpoenas, and orders of the House; controls the unappropriated rooms and corridors of the House wing of the Capitol; appoints conference and special committees, the official reporter of debates, the official stenographers, the parliamentarian and his office force of clerks. He exercises wide influence over the course of legislation and has the power to recognize anyone who may desire to speak. The House may, by a majority vote, elect him to and remove him from office.

Spearmint (*spēr′mĭṅt*). See *Mint.*

Specie Payment (*spē′shĭ pā′mẹnt*), payment in any metallic money.

Resumption of specie payment is a term used in American history, usually in reference to the resumption of coin payments after the Civil War, although specie payment has frequently been suspended and resumed in the course of U.S. history.

At the beginning of the Civil War in 1861, the banks of New York City were required, owing to the disturbed conditions of business, to suspend payment in coin, and in this course they were followed by most of the banks throughout the country. Congress came to the relief by authorizing the issue of large quantities of U.S. notes, making them a legal tender for all purposes, except payment of interest on the national debt and duties on imports. This caused the paper money, known as *greenbacḳs,* to depreciate in value, and had the effect of bringing about uncertainty in financial and commercial affairs. In 1866 Congress passed an act to retire the greenbacks by the payment of specie and by 1868 the amount in circulation had been reduced to $356,000,000, but retirement ceased in that year and by 1874 the amount had again risen to $382,000,000. The matter of resuming specie payment was taken up in earnest in 1875, when Congress in the Resumption Act of 1875 ordered that government contracts, including paper currency, should be payable in specie on and after Jan. 1, 1879. Through the herculean efforts of John Sherman, Secretary of the Treasury, sufficient gold was accumulated in the treasury through the sale of bonds and the resumption of specie payment began on schedule. When it became known that greenbacks could readily be redeemed for gold, there was no great demand for redeeming them and the economic situation quickly righted itself. However, the resumption caused an increase in the value of currency and a corresponding decrease in prices so that debtors suffered some losses by making payments in money whose value was increasing rapidly.

Species (*spē′shēz*), the term used to denote a single group of animals or plants, which are subordinate to a genus and are capable of reproducing similar organisms by interbreeding. In the kingdom of organic nature the species are founded on identity of form and structure, both external and internal. The species have capability of producing beings like themselves, and the offspring likewise possesses the power of reproduction. The term species is applied in mineralogy and chemistry to inorganic substances having identity of composition, physical properties, and crystallization.

Specific Gravity (*spê-sĭf′ĭḳ grăv′ĭ-tȳ*), or RELATIVE WEIGHT, the ratio of the weight of a substance to that of the same volume of another substance taken as a standard of comparison. Since temperature and other agencies have an influence upon the weight of a given bulk of matter, it is necessary to know the temperature in all exact measurements of standards. Pure distilled water at a temperature of 62° F. is taken as the standard for measuring the specific gravity of liquids and solids, which is reckoned unity, and air is the standard for designating the specific gravity of gases. A pint of mercury weighs 13.6 times as much as a pint of water; thus, if we compare the weights of equal bulks of mercury and water, we find that the mercury is 13.6 times as heavy as water. Hence, the specific gravity of mercury is 13.6.

According to Archimedes' law, a body in water is buoyed up by a force equal to the weight of the water it displaces. To obtain the specific gravity of any substance heavier than water, a given bulk is weighed in pure distilled water, then in air, and the specific gravity is found by dividing the weight in air by the loss of weight in water. The specific gravity of solids lighter than water, such as a piece of cork, is found by attaching a given bulk to a piece of metal (say copper) heavy enough to sink the cork in the water. The weight of cork in air being known, it is divided by the weight it loses in water (which is found by ascertaining the loss of weight to both the copper and cork; then finding the weight lost by the copper when immersed; then the difference in this weight and the weight they both lose in water; the result is the weight that the cork loses in water), and the quotient equals the specific gravity.

Specific gravity may vary slightly in different specimens of the same substance, but in the table below is given the specific gravity usually assigned to the common substances named:

Alcohol	.79	Iridium	21.80
Bone	1.75	Iron	7.78
Cast Iron	7.21	Limestone	2.75
Chalk	2.65	Liquefied Oxygen	1.12
Cobalt	8.95	Mercury	13.60
Copper	8.90	Milk	1.03
Cork	.24	Ocean Water	1.03
Diamond	3.50	Pine Wood	.66
Ether	.71	Platinum	21.53
Glass	2.90	Potassium	.96
Gold	19.30	Quicklime	.80
Graphite	2.75	Silver	10.47
Honey	1.45	Sulphur	2.00
Human Body, alive	.89	Sulphuric Acid	1.84
Ice	.91	Zinc	7.15

Specific Heat (*spė-sĭf′ĭk̜ hēt*), the amount of heat necessary to raise the temperature of a unit quantity of substance one degree. In chemistry and physics the quantity of substance is usually one gram and the temperature rise is ordinarily one degree Centigrade. Specific heat is expressed in calories and depends on the nature of the substance, the physical state of the substance, the temperature, and the way in which the measurement is made.

Water has a specific heat of one calorie per degree. This changes slightly, increasing with the temperature at which it is measured. For other liquids the value does not differ from one very greatly, but for solids the specific heat is so small that it is usually multiplied by the atomic or molecular weight of the substance under consideration in order to obtain a value of convenient magnitude for purposes of comparison and mathematical operations. This product of specific heat and atomic weight is called the *atomic heat capacity* of the substance and was found by Du Long and Petit to have a value of approximately 6.2 calories per gram-atomic weight of all heavy metals at or above room temperature. This relationship has been useful in determining the atomic weight of unknown elements known to be heavy metals. It does not work for light elements like carbon.

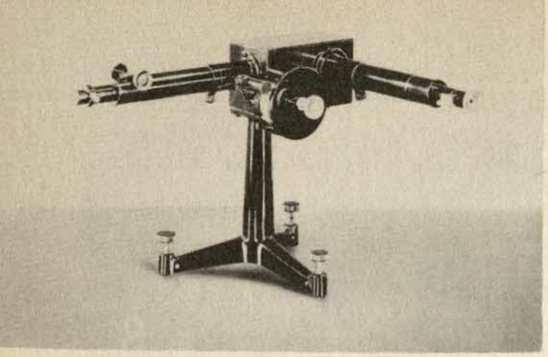
The specific heat, and consequently the *molar heat capacity,* of gases depends on the way in which the measurement is made as well as on the nature of the gas and the temperature of measurement. If the gas is kept at constant *volume* the heat capacity (Cv) is less than the corresponding heat capacity (Cp) measured at constant pressure. For gases containing two atoms per molecule this difference is two calories per molecular weight, while for solids and liquids it is negligible.

Specific Volume (*spė-sĭf′ĭk̜ vŏl′u̇m*), the volume occupied by unit mass of any substance. It is the reciprocal of the density of a material. The usual unit of specific volume in British quantities is cubic inches per pound, while in metric units it may be expressed as cubic centimeters per gram. Hydrogen gas is the material having the largest specific volume, 11 cu. ft. per oz. at usual pressure. The specific volume of iridium metal has the low value of 1.24 cu. in. per lb.

Spectacle (*spĕk̜′tȧ-k̜′l*), or SPECTACLES, an instrument for aiding or shielding the eyes. It consists of a pair of lenses, which are framed, usually with metal, so as to keep them in their proper position. The lenses are made of a fine quality of glass and are ground to accommodate the need of the wearer. As eyesight becomes weakened in old age, it is frequently necessary to change the glasses, which is also the case with those wearing spectacles to shield the eyes from light too strong for them to bear. *Long sight,* or *farsightedness,* is remedied by wearing convex glasses, which converge the rays of light on the retina of the eyes. *Short sight,* or *nearsightedness,* on the other hand, requires concave lenses, which diverge the rays of light to cause the image to be formed on the retina. *Astigmatic sight* is a defect of the eyes in which the focus of the crystalline lens varies in different azimuths, and can be remedied by spectacles in which the focus differs in different azimuths. Spectacles of wire gauze, or specially resistant flat glass, are worn to exclude dust particles or other foreign matter; such devices are commonly called *goggles.*

Spectrometer (*spĕk̜-trŏm′ė-tẽr*), an optical instrument for measuring the wave lengths of spectrum lines. An instrument which is intended for observation of the spectrum without measurement is termed a spectroscope, while, if the instrument be provided with a camera for photographing the spectrum, it is termed a spectrograph. An instrument with which it is possible to measure the wave lengths of the spectrum lines as well as the intensity is termed a spectrophotometer.

The pioneer observations in spectroscopy were performed by Joseph Fraunhofer (1787-1826), a German physicist, who found in the spectrum of the sun many dark lines. These lines, known as Fraunhofer lines, appear in the solar spectrum as a result of the absorption of the light emitted by colder gases surrounding the sun. Long study of the spectrum has shown that each chemical element when vaporized in an electric arc emits light having a number of characteristic wave lengths which are typical of the element. Whenever one of these wave lengths appears in a spec-



Courtesy Bausch & Lomb Optical Co., Rochester, N. Y.
Figure 1
LARGE WAVE-LENGTH SPECTROMETER
Constant-deviation type utilizing glass prism

trum, it denotes the presence of the element in the light source. This result has been of great importance in studies by spectroscopic methods, of such diverse items as: impurities in metals, mineral content of vegetables, identification of rare chemical elements, and numerous other phenomena. A curious example of the power of the spectroscope was the discovery of the element helium in the spectrum of the sun by J. Norman Lockyer in 1868. This element was not discovered on the earth until 1895.

The essential part of any spectrum-forming device is some means for separating the light of various wave lengths, so that each color emitted by a light source may be observed independently. A convenient means of doing this is to pass the light through a prism of glass or quartz. Such prisms, in the form of triangles or quadrangles, disperse the light as a result of differences of velocity of the light waves of various colors. The red rays of light are deviated least in such prisms and emerge at a smaller angle from the incident rays than do rays of other colors. The violet rays are deviated most in glass prisms, but a quartz prism is transparent to ultraviolet light and deviates these rays even more than the violet rays.

In the spectrometer the rays of light may be viewed after deviation by the prism with a telescope mounted so that the rays enter it. In some instruments the telescope may be rotated around an axis through the prism. A suitable scale moving with the telescope is used to measure the angles of deviation for light of different wave lengths. In other spectrometers the telescope is fixed and the prism is rotated. A wave-length scale is attached to the control knob rotating the prism. Figure 1 shows a prism spectrometer mounted on a tripod base. The prism is contained within the central housing. It may be rotated by the control knob with an attached wave-length scale. Light enters the spectrometer through the collimator at the right, by means of which it is rendered parallel before striking the prism. The telescope at the left of the instrument is used to view the deviated light after it passes through the prism. The Pellin-Broca type of prism used in this spectrometer is made of a single piece of flint glass.

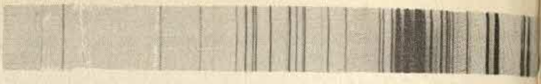


Figure 2
VISUAL PORTION OF THE COPPER SPECTRUM
Photograph (sometimes called spectrograph) taken with a prism spectrograph and enlarged three times

In some spectrometers the prism is replaced by a diffraction grating ruled upon glass or metal. Such a grating has the property of deviating light rays of different wave lengths through different angles. For many purposes the diffraction grating is preferable to the prism, since it produces a greater separation of the spectrum lines. However, the grating suffers from the defect of producing several spectra, which are all weaker in intensity than the single spectrum of the prism. As a result the prism is necessary for spectroscopy of light sources of low intensity.

In Figure 2 is shown a photograph of the copper spectrum taken with a prism spectrograph. The spectrum is produced by passing a spark between electrodes of copper of sufficient intensity to vaporize and excite some of the copper atoms. The light emitted enters the spectrograph collimator, then passes through the prism from which it emerges as a spectrum and is photographed. Each line of the spectrum represents an image of the slit in the collimator formed with light of a single wave length from the copper arc. See also *Spectrum*.

Spectroscope (*spĕk'trô-skōp*), See *Spectrometer*.

Spectroscopy (*spĕk-trŏs'kô-pȳ*), the science of spectroscopic phenomena, including the production and study of spectra. See *Spectrometer; Spectrum*.

Spectrum (*spĕk'trŭm*), an array of colors usually produced by passing a ray of light through a prism or a diffraction grating. The word is ordinarily restricted to visible light, but is used in a general sense to cover a wide range of electromagnetic radiation of which visible light is only a small part. Sir Isaac Newton (1642-1727) produced, studied, and named the first spectrum. He passed a beam of sunlight from a small hole in the wall of a darkened room through a 60° prism and permitted it to fall on a screen about 18 ft. away. The beam of white light, after having been bent by the prism, appeared on the screen as a band of colors arranged in the sequence red, orange, yellow, green, blue, indigo, and violet—the violet having been bent the most and the red the least. According to the wave theory of light, these various colors are described by assigning to each a characteristic wave length. The wave length for violet light is the shortest of the visible spectrum while that of red light is the longest. There are much shorter, invisible radiations on the violet side of the spectrum however, including ultraviolet light, X-rays, and perhaps cosmic rays. On the red side (long wave length) of the spectrum such larger wave-length radiations as infrared and radio waves have been detected and studied. The production of spectra showing these various frequencies is accomplished in various ways depending upon the region under consideration.

The visible spectrum may be produced in two different ways. In one method a ray of light is passed through a lens, to render it parallel, and then through a prism which deviates each color through a different angle. The deviated rays are then passed through a second lens and focused on a screen or scale in such a way that there is little, if any, overlapping of various colors.

A second method of producing a visible spectrum consists of passing a parallel ray of light through, or reflecting it from the face of, a diffraction grating (a piece of glass or other transparent material on which are ruled many parallel lines). The regularly spaced lines (several thousand per centimeter) permit much of the light to pass through unchanged but they also bend (diffract) a part of the light laterally to form a visible spectrum on either side of the main beam of transmitted light. Gratings are frequently used in the production of pure spectra for analytical purposes in colorimetry or spectrophotometry, but crystals may be used as diffraction gratings in the identification of unknown X-rays.

Spectra are classified into *emission spectra* and *absorption spectra*. The former arise from the examination of light directly from a radiating source; the latter are composed of unabsorbed light after passing through a medium. Emission spectra consists of three kinds: *continuous spectra*, composed of all colors blending continuously into one another such as the spectrum produced from white light from a tungsten filament; *line spectra*, consisting of only a few colors showing up as sharply defined lines and manifesting no blending or continuity with other colors, *i.e.*, light from excited gas atoms as in mercury vapor or neon or helium gas; *band spectra*, consisting of a series of bands, one side of which is very sharp and the other very diffuse. These are considered to arise from excited molecules; very precise measurements with instruments of high resolving power indicate that each band is composed of numerous lines.

The use of spectra for chemical analysis is based upon the fact that atoms of each element have a characteristic *emission* spectrum, or on the fact that some chemical elements and compounds show a characteristic *absorption* spectrum. In the former the substance may be heated to produce its characteristic radiation which is passed through a prism giving the wave lengths on a calibrated scale, while in the latter the constituents of white light are passed through the substance and the transmitted light is examined to see which wave lengths have been removed. Helium was detected in the gaseous vapors surrounding the sun in this way.

Speculum (*spĕk'ū-lŭm*), an alloy of tin and copper, usually in the proportion of 58 parts of tin to 126 parts of copper. It is employed in preparing the reflecting surfaces in several kinds of telescopes. Glass is now frequently used for the same purpose, being prepared by spreading a covering of silver film over the side turned toward the object. In surgery, a speculum is an instrument for dilating canals and cavities in the human body, as in the ear, thus facilitating an examination of their interior. A reflecting body is an essential part of these instruments, since it serves to facilitate an examination of the parts by throwing upon them a strong light.

Spee (*sphā*), COUNT MAXIMILIAN VON, German naval officer, born at Copenhagen, Denmark, in 1861; died at sea near the Falkland Islands, Dec. 8, 1914. As a vice admiral in the Imperial German Navy, Von Spee played an important part in building its World War I strength and determining its wartime strategy. In 1914, he was placed in command of the German Pacific fleet and directed the battle in which an entire British naval squadron was wiped out off the coast of Chile on Nov. 1, 1914. A month later, Von Spee's fleet was annihilated by a British force under Rear Admiral Sir Doveton Sturdee in the Battle of the Falkland Islands, and he himself went down on his flagship, *Scharnhorst.* The *Graf Spee,* a German pocket battleship which earned some fame in World War II, was named for him.

Speech (*spēch*), vocal sounds uttered to communicate ideas, produced by a modification of the vibrations generated in the larynx. These modifications take place as the vibrations pass outward through the cavities of the mouth and nose. Speech appears to be controlled by the nerve centers that are seated on the left side of the brain, in the back part of the third frontal convolution. Although speech is natural, its exercise depends upon careful training. Articulate speech is stopped by pressure or injury to this part of the brain, but such injury does not necessarily prevent vocalization, nor does it prevent the expression of thought by signs or by writing. See also *Voice.*

Speed (*spēd*). See *Velocity.*

Speed and Distance Records (*spēd ănd dĭs'tans rĕk'ērdz*). The following are some of the official world records in aviation, ocean travel, racing, and track and field and other sports.

AERONAUTICS. The following are the more important aeronautical records—

Longest Nonstop Flight: 24,325 m. around the earth from Castle Air Force Base, Calif., to March Air Force Base, Calif., by three U.S. Air Force Boeing B-52 Superfortress bombers, commanded by Maj. Gen. Archie J. Old Jr., Jan. 16-18, 1957.

Speed in Level Flight: 1,652 m.p.h., set by a U.S.S.R. E-166 jet, near Moscow, July 7, 1962.

Altitude: 314,750 ft., set by Maj. Robert M. White, in a U.S. Air Force X-15 rocket plane over Edwards Air Force Base, Calif., July 17, 1962.

Balloon, Altitude (manned): 113,500 ft., set by Comdr. Malcolm Ross and Lieut. Comdr. Victor G. Prather in a U.S. Navy balloon ascent from the aircraft carrier *Antietam* in the Gulf of Mexico, May 4, 1961.

ATLANTIC STEAMSHIP CROSSING. Set by the *United States* of the United States Lines, 3 days, 10 hr., and 40 min., eastbound from New York to Land's End, England, July 3-7, 1952.

MOTOR BOAT. Set by Donald Malcolm Campbell, of Great Britain, 260.35 m.p.h. (average for two runs), in the jet-propelled *Bluebird II*, on Lake Coniston, England, May 14, 1959.

AUTOMOBILE RACING. *Over a 1-m. course:* 394.196 m.p.h. (average for two runs), set by John Cobb, of Great Britain, at Bonneville, Utah, Sept. 16, 1947.

HORSE RACING. The following are the running, trotting, and pacing records, all for one mile—

Running: 1 min., 32.2 sec., set by "Swaps," at Inglewood, Calif., on June 9, 1956.

Trotting: 1 min., 55.25 sec., set by "Greyhound," at Lexington, Ky., on Sept. 29, 1938.

Pacing: 1 min., 54.2 sec., set by "Adios Butler," at Lexington, Ky., on Oct. 4, 1960.

ICE SKATING: The following are some of the more important ice-skating records—

Men's 500 meter: 40.2 sec., set by Yevgeni Grishin, of the U.S.S.R., Jan. 22, 1956.

Men's 1,000 meter: 1 min., 22.8 sec., set by Grishin, Jan. 12, 1955.

Men's 5,000 meter: 7 min., 34.3 sec., set by Johnny Nilsson, of Sweden, Feb. 24, 1963.

Women's 5,000 meter: 9 min., 1.6 sec., set by Rima Zhukova, of the U.S.S.R., Jan. 24, 1953.

SWIMMING: The following are some of the more important swimming records—

Men's 110-yd. free style: 55.1 sec., set by John Devitt, of Australia, Feb. 7, 1959.

Men's 220-yd. free style: 2 min., 1.6 sec., set by Jon Konrads, of Australia, Feb. 20, 1961.

Men's 440-yd. free style: 4 min., 15.9 sec., set by Konrads, Feb. 28, 1960.

Men's 880-yd. free style: 8 min., 59.6 sec., set by Konrads, Jan. 10, 1959.

Men's 1-m. free style: 18 min., 56.4 sec., set by Konrads, June 13, 1958.

Men's 110-yd. butterfly: 59.4 sec., set by Kevin Berry, of Australia, Oct. 25, 1962.

Men's 110-yd. back stroke: 1 min., 1.5 sec., set by John Monckton, of Australia, Feb. 15, 1958.

Women's 110-yd. free style: 59.9 sec., set by Dawn Fraser, of Australia, Oct. 27, 1962.

Women's 220-yd. free style: 2 min., 11.6 sec., set by Dawn Fraser, Feb. 27, 1960.

Women's 440-yd. free style: 4 min., 45.4 sec., set by Ilse Konrads, of Australia, Jan. 9, 1960.

Women's 1-m. free style: 22 min., 5.5 sec., set by Lenie de Nijs, of The Netherlands, Aug. 12, 1955.

Women's 110-yd. back stroke: 1 min., 11 sec., set by Natalie Steward, of South Africa, Sept. 24, 1960.

TRACK AND FIELD. The following are major world track and field records—

100-yd. dash: 9.2 sec., set by Frank Budd, of the U.S., June 24, 1961.

Men's 440-yd. run: 45.7 sec., set by Glenn Davis, of the U.S., June 14, 1958.

Men's 880-yd. run: 1 min., 45.1 sec., set by Peter Snell, of New Zealand, Feb. 3, 1962.

Men's 1-m. run: 3 min., 54.4 sec., set by Peter Snell, Jan. 27, 1962.

Men's high jump: 7 ft., 5¼ in., set by Valeri Brumel, of the U.S.S.R., Sept. 29, 1962.

Running broad jump: 27 ft., 3 in., set by Igor Ter-Ovanesyan, of the U.S.S.R., June 10, 1962.

Pole vault: 16 ft., 5 in., set by Brian Sternberg, of the U.S., April 27, 1963.[1]

Men's 16-lb. shotput: 65 ft., 10½ in., set by Dallas Long, of the U.S., May 18, 1962.

Men's 16-lb. hammer throw: 231 ft., 10 in., set by Harold Connolly, of the U.S., June 21, 1962.

Women's 100-yd. dash: 10.3 sec., set by Marlene Mathews, of Australia, March 20, 1958.

Women's 880-yd. run: 2 min., 2 sec., set by Dixie Willis, of Australia, March 3, 1962.

Women's 1-m. run: 4 min., 45 sec., set by Diane Leather, of Great Britain, Sept. 21, 1955.

Speedwell (*spēd'wĕl*), any of a genus (*Veronica*) of herbs and shrubs native to the temperate regions of both hemispheres. They include about 200 annual and perennial plants. Many species produce beautiful flowers, generally colored blue, pink, or white. The *common speedwell,* having bitter and astringent leaves, is used to some extent in medicine. *Brooklime,* a common wild aquatic plant found in Europe and North America, belongs to this genus.

Speicher (*spī'kẽr*), EUGENE EDWARD, artist, born in Buffalo, N.Y., April 5, 1883; died in Woodstock, May 11, 1962. After studying painting in Buffalo and New York City, he went to

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[1] A mark of 16 ft., 8¾ in., set by Pentti Nikula, of Finland, on Feb. 2, 1963, was ineligible for recognition because it was set indoors.

Europe in 1910 and spent two years in London and other art centers. Upon his return, he became established as a portrait and landscape painter. His work won many awards, and it is represented in museums and galleries throughout the U.S. Among his notable paintings are "Helen Appleton" and Katharine Cornell (*q.v.*) as *Candida.*

Speke (*spēk*), JOHN HANNING, explorer, born in Jordans, England, May 4, 1827; died near Bath, Sept. 15, 1864. He entered the Indian army in 1844 and, while in service, explored the Himalaya and Tibet. In 1854 Speke went to Somaliland with Sir Richard Francis Burton (*q.v.*) but was wounded and sent home. In 1856 he joined Burton's expedition to explore the great lakes and interior of central Africa. Starting from Zanzibar in June 1857, the explorers reached Tanganyika Lake in January 1858. Speke, traveling north without Burton, reached the southern part of Victoria Nyanza. He was convinced he had found there the Nile's source, but it was found later that the lake was only the river's chief reservoir. He continued to explore the region of the river, 1860-62, following it to Ripon Falls near its outlet from the lake. Speke returned to England in 1863 and in the same year published a journal on his explorations of the Nile. In the following year he wounded himself fatally in a hunting accident.

Spellman (*spĕl'măn*), FRANCIS JOSEPH, cardinal and archbishop of New York, born in Whitman, Mass., May 4, 1889. After receiving degrees in the U.S. and at Rome, he was ordained in 1916, and became assistant at All Saints' Parish in Roxbury, Mass. He next served on the editorial staff of the Boston *Pilot* (1918-22), and was then appointed assistant chancellor of the archdiocese of Boston (1922-25). Returning to the Vatican, he was appointed attaché in the office of the secretary of state and was translator of papal broadcasts and encyclicals (1925-32). In 1932, he was consecrated bishop and was auxiliary bishop of Boston until 1939, when he became archbishop of New York. In February 1946, he became a cardinal of the Roman Catholic Church. During World War II, he traveled widely, visiting Rome and U.S. forces on the battle fronts as military vicar of the U.S. armed forces. He has published "The Road to Victory" (1942), "No Greater Love" (1945), "Prayers and Poems" (1946), "The Foundling" (a novel, 1951), "Cardinal Spellman's Prayer Book" (1952), and "What America Means to Me and Other Poems and Prayers" (1953).

FRANCIS, CARDINAL SPELLMAN

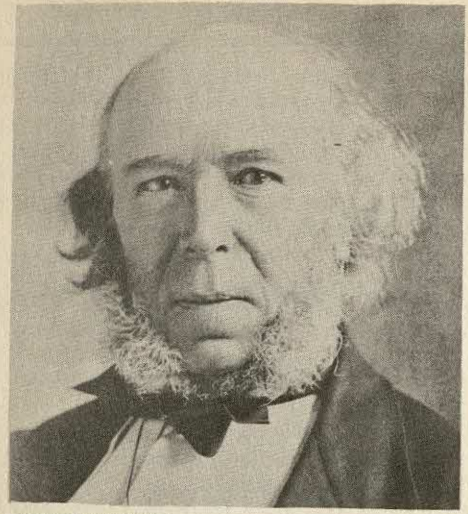
Spelter (*spĕlt'ẽr*). See *Zinc.*

Spemann (*shpä'män*), HANS, zoologist, born June 27, 1869, in Stuttgart, Germany; died in Freiburg, Germany, Sept. 12, 1941. He studied medicine at the Univ. of Heidelberg. From 1894 to 1908 he worked at the Zoological Inst. at Würzburg, studying at the same time zoology, botany, and physics. In 1908 he became professor of zoology at Rostock and during World War I was director of the Kaiser Wilhelm Inst. of Biology at Berlin-Dahlim. After the war he served as professor of zoology at the Univ. of Freiburg, remaining there from 1919 until his retirement in 1935. His chief field of specialization was the embryonic development of amphibia. In 1935, he won the Nobel Prize for physiology and medicine "for the discovery of the organizer-effect of embryonic development."

Spencer (*spĕn'sẽr*), a town (township) and village in central Massachusetts, 10 m. w. of Worcester, on the New York Central R.R. (freight). The village has shoe factories, and there are dairy and poultry farms nearby. The town, which is in the Worcester standard metropolitan statistical area, was settled in 1721. Population of town, 1960, 7,838; of the village, 5,593.

Spencer, HERBERT, founder of the system of synthetic philosophy, born in Derby, England, April 27, 1820; died in Brighton, Dec. 8, 1903. He received careful training at home under his father (a teacher of mathematics in Derby) and was early instilled with interest in natural sciences and entomology. In 1837, Spencer became a railway engineer, and for eight years followed this occupation. He moved to London in 1848, where he was a member of the editorial staff of the *Economist,* and also contributed to the *Westminster Review.* In 1850 he published his first work of importance under the title of "Social Statics," in which the ethical and social growth of mankind is outlined largely on the theory of evolution.

Spencer announced the prospectus of his system of synthetic philosophy in 1860, a 10-volume work which he completed in 1896. Spencer's importance resides very largely in the fact that he made himself a spokesman for science as a



HERBERT SPENCER

philosophy and a way of life at a time when scientific investigation was becoming a guiding force in all intellectual progress. His doctrine of evolution—slightly at variance with Darwin's conclusions on the organic descent of man—was applied generally to all ethical, philosophical, and scientific problems. He tended strongly toward the empirical, scientific method of deducing general laws from the close observation of actual phenomena. However, although he was influenced by Darwin, who was his contemporary, he went far beyond him by applying the central idea of evolution not only to the organic world but to psychology, the social sciences, and what he called philosophy. Spencer believed that the theory of evolution explained the biological structure of the organic world and man himself as well as the relations of men to each other, the relations of man to society and, finally, all stages of human history.

Today Spencer is considered a representative of an age in which natural sciences attempted to reach far beyond their actual task by trying to solve problems which cannot be solved except through a philosophical approach. This approach must, of course, consider all facts known to natural sciences, but it ought not to misuse science beyond its own realms.

The writings of Spencer were appreciated much earlier in America than in England, and on his visit to the U.S., in 1882, he was enthusiastically received. Many of his books have been translated into the leading languages, and his theories have had a wide influence from the standpoint of social, philosophical, scientific, and moral thought. He devoted his time zealously to his self-imposed task, refusing all academic honors and memberships in famous domestic and foreign societies. Among the most important of his writings not named above are "First Principles," "Principles of Biology," "Principles of Psychology," "Principles of Sociology," and "Principles of Ethics," which comprised the volumes in which he outlined his system of philosophy, "Descriptive Sociology," "Political Institutions," "Ethics of Social Life," "Positive Beneficence," "Education," "Classification of the Sciences," "Man Versus the State," and "Factors of Organic Evolution."

Spencer, PLATT ROGER, American penman and creator of what is known as Spencerian penmanship, born in East Fishkill, N.Y., Nov. 7, 1800; died in Geneva, O., May 16, 1864. After teaching his first writing class at the age of 15, Spencer studied law and business. Becoming a full-fledged teacher, he was instrumental in the founding of business schools throughout the U.S. He published two works in penmanship, "Spencer and Rice's System of Business and Ladies' Penmanship" and "Spencerian or Semi-Angular Penmanship."

Spencer Gulf (*spĕn'sẽr gŭlf*), an extensive inlet on the southern shore of Australia, in the State of South Australia. It extends from the Indian Ocean toward the northeast a distance of 200 m. and is from 3 to 90 m. wide. Cape Spencer and the Yorke Peninsula are east of it, and Cape Catastrophe and the Eyre Peninsula lie immediately west. At its entrance are Thistle and Gambier Islands. Port Augusta is at the head of the gulf.

Spengler (*shpĕng'lẽr*), OSWALD, philosopher, born at Blankenberg, Germany, May 29, 1880; died in Munich, Germany, May 8, 1936. Educated at the Univs. of Halle, Munich, and Berlin, he taught in German secondary schools for some years, but eventually retired and thereafter devoted himself to writing. After World War I, he won international influence with his ideas on the development of history.

Spengler, considering our whole world completely mechanized, without soul, striving only for palpable economic and materialistic values, concluded that our approach to history is perverted and the mechanized rationalism of the 20th century is dangerous. He thought that cultures of the past were not civilizations with primarily technical qualities, but growing organisms. Like a biological growth, each individual culture has a period of youth, maturity, and decay. Spengler developed this idea in his famous book, "Der Untergang des Abendlandes" ("The Decline of the West"), first published in German in 1920 and in English, 1926-28. In this "morphology" of history, he evolved a concept of the development of the specific forms of individual cultures. He asserted that these forms occur in each of the four cultures into which he divides the history of civilization: the Indian, the Ancient, the Arabic, and the so-called Western civilization. In broad outline, he distinguished

OSWALD SPENGLER

between "springtime," which he considers as the "intuition out of the landscape," when the great mythologists are born by the immediate contact with nature; "summer," the periods of reformation, and critical philosophy, and mathematics; "autumn," characterized by enlightenment, the evolution of great philosophical systems and certain mathematical developments; and "winter," the period of the foundation of the great metropolis, the growth of standardization and mechanization, the dying away of emotional intuition and religion, and the increasing impossibility of solving the problems of life. In other words, from step one to step four, the intuitive powers decrease, while the rationalizing and mechanizing powers increase.

Spengler then tries to prove that these four stages occur in each civilization and cites examples. For example, he considers that the last stage, mechanization with its resulting despair, had a parallel development in each of his four groups of cultures: in India, with the development of Buddhism after 500 B.C.; in Antiquity, with the Hellenistic Roman Stoicism after 200 B.C.; in the Arabic world, with the fatalism of the later Islam after 1000 A.D.; and in Western civilization, with socialism and materialism after the end of the 19th century. In the development of these examples he evidenced a wide and almost unbelievably exact knowledge of all realms of learning, from mathematics to music, from religion to technique, from strategy to architecture.

Spengler has been called "the spiritual father of the Nazi revolution" and his concept has been widely discussed and widely refuted, but it cannot be denied that many of the developments of the years following World War I were predicted by him as logical deductions of his morphological comparisons of corresponding stages of development in the cultures of the world. In fairness it must be added that some, perhaps many, of the "Spenglerian" aspects of Nazism apparently sprang from Nazi leaders' deliberate perversion of his basic doctrines.

Spenser (*spĕn'sẽr*), EDMUND, one of the greatest poets of the English language, born in London, probably in 1552; and died there Jan. 16, 1599. Only his contemporary, Shakespeare, surpassed him in poetic genius, and the two names are enough in themselves to establish the renown of the Elizabethan era in literature.

Little is known of Spenser's parents except that they could not have been rich or influential since the poet was a charity student at school and dependent on his own earnings throughout his life. He attended Cambridge Univ., where he studied Italian and French as well as the usual Latin and Greek, and where he learned to be a militant Puritan for the rest of his life. He was early writing verse and discovering his life work in literature.

After leaving Cambridge, Spenser became secretary to the bishop of Rochester. In that city he wrote much of "The Shepheardes Calender," his first published work and the first set of formal pastoral poems in English. When it was issued, in 1579, it brought him immediate acclaim, but no advancement and little money. It is, however, a landmark in English poetry, for Spenser had dared to write pastorals in English, and in common speech, instead of the traditional Latin; and he proved in this work the richness and dexterity of the mother tongue as a medium for poetry.

In spite of success as a poet, Spenser was forced into reluctant servitude as a government official, with a residence in Ireland which was destined to continue throughout his life. He began as secretary to the Deputy of Ireland, Lord Grey, and progressed through minor offices and sinecures until he was granted an estate near Cork, where he took up residence with Sir Walter Raleigh for neighbor.

When Raleigh saw the three completed Books of "The Faerie Queene" on which Spenser had been working for many years, he took the poet back with him to London and had him offer the poem to the Queen. Elizabeth allowed it to be dedicated to her. She applauded it at public readings and granted a pension to the poet. But the pension of £50 a year was not enough to enable him to give up his Irish estate and live in London where, as the reigning poet, he had hoped to stay. But the year of 1590, when the first part of "The Faerie Queene" was published, marked the peak of his fortunes. He was at court and among his fellow poets, and everywhere his new work was acknowledged as the long-awaited epic poem of England. He had done what all the Elizabethan poets had hoped and vowed to do—he had presented England with its national epic. He was then not quite 40 years old.

On his return to Ireland he worked constantly on the great poem that he was never to finish. In 1594, he married Elizabeth Boyle for whom he had written the "Amoretti," or love-sonnets. These beautiful sonnets were published in 1595, soon before the next three Books of "The Faerie Queene." They were written in a form which Spenser devised, three linked quatrains and a couplet, and were an elegent perfection of his Renaissance models.

But the poet's fortunes and his time were running out. His home, Kilcolman Castle, was burned in the Irish rebellion and Spenser, with his wife and four children, fled to Cork. From there he was sent to London on an official errand where he died suddenly, and it is claimed, in want. He was buried in Westminster Abbey near the tomb of Chaucer, whose stature he had equaled in life.

Spenser's reputation rests on "The Faerie Queene," of which only six books of the projected 12 were published. On the surface, it is the story of knights sent out from the court of Gloriana, the fairy queen, to dispense justice and redress wrongs. Actually it is an allegory of the human struggle for perfection. It pours out enthusiasm for knowledge (being a product of the Renaissance), a patriotic fervor for England, for the Protestant religion, and lastly for Queen Elizabeth herself. Gloriana, in the poem, is Elizabeth, and was to have appeared in the 12th Book as the bride of Arthur, the legendary king of England. Thus Spenser linked the greatness of Arthurian England with the glory of Elizabeth's England. The work is richly laden with figures of speech and with references to classical and Renaissance literature. It was done in the Spenserian stanza of nine lines, a departure from the seven-line stanza of Chaucer and the Italian eight-line stanzas. Here, as in his other work, the emotional depth and the musical quality of his poetry made him "the poet's poet."

EDMUND SPENSER

His other published works include the pastoral poem, "Colin Clout's Come Home Again," wherein he describes his own experiences at Elizabeth's court; "Astrophel," a lament on the death of Sidney; the "Epithalamion," a wedding song modeled on the Italian canzone; and a prose treatise on Irish affairs, "View of the Present State of Ireland," wherein he writes as an Irish landholder with harsh Puritanism and a narrow pride in England which shut out the sight and sound of human suffering.

Sperm (*spûrm*), in biology, the male fertilizing element.

Spermaceti (*spẽr-mȧ-sē′tĭ*), a white fatty substance found in the sperm oil of the head of the sperm whale and several other animals. It is in the fluid state while the animal is alive, but separates after death and forms concrete deposits differing from the sperm oil, the latter being a neutral liquid at ordinary temperatures. Spermaceti is inodorous and nearly tasteless. It has a white appearance, resembling wax, and is used largely for making candles. In pharmacy it serves as the basis of ointments and cerates. The sperm whale is a large species of the whale family native to the Pacific Ocean, often weighing 175 to 215 tons, and the male attains a length of 60 to 80 ft. A large-sized sperm whale yields 10 to 25 barrels of spermaceti and 60 to 100 barrels of oil.

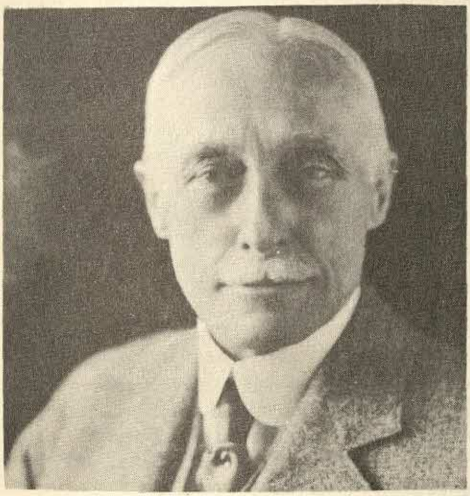
Spermatic Cord (*spẽr-măt′ĭḳ ḳŏrd*), in medicine, a combination of arteries, veins, lymphatics, and nerves surrounding the excretory duct of the testicles. It contains the *vas deferens* (*q.v.*).

Spermatogenesis (*spûr-mȧ-tô-jĕn′ê-sĭs*), biological term, meaning the development of sperm (*q.v.*) cells.

Spermatozoön (*spûr-mȧ-tô-zō′ŏn*), zoölogical term, meaning a male reproductive cell, consisting usually of head, middle piece, and locomotory flagellum.

Sperm Whale (*spẽrm hwāl*). See *Whale*.

Sperry (*spĕr′ȳ*), ELMER AMBROSE, electrical engineer and inventor, born in Cortland, N.Y., in 1860; died in 1930. Among Sperry's more than 400 patents are a remarkable number of vitally important inventions, including an improved dynamo; a special type of arc lamp (1879); a high-intensity searchlight (1918); an electrochemical apparatus for the production of caustic alkali and chlorine compounds; a chlorine detinning process for recovering tin from scrap; and many devices, such as stabilizers for ships and airplanes, based upon applications of the gyroscope (*q.v.*). He founded a number of factories which put his devices on the market and established an electrochemical research laboratory in Washington, D.C. He was chairman of the division of engineering and industrial research of the National Research Council (1927).



ELMER A. SPERRY

Spey (*spā*), a river of Scotland, rising in Inverness-shire; after a course of 110 m. it discharges into Moray Firth. It has important fisheries, chiefly salmon. The Spey is the second longest river of Scotland, being exceeded in length only by the Tweed.

Spezia (*spĕt'syä*), a seaport city of Italy, on the Gulf of Spezia, 50 m. S.E. of Genoa. It is situated on the coastal railroad, has an excellent harbor, and is the most important naval station of Italy. Besides shipbuilding, extensive manufactures of cannon, gunpowder, and clothing for the army and navy were maintained by the government at Spezia before World War II. The city has a large trade in cereals, wines, olive oil, and fruits. In April 1945, American Fifth Army troops captured the city in closing the Italian phase of the war. Population, *ca.* 110,000.

Sphene (*sfēn*), the name of a mineral belonging to the titanite variety, so called from the wedge shape of the crystals. In color it varies greatly, but yellow, green, and dark brown predominate. It is found in a crystallized form with gneiss, granite, and mica slate.

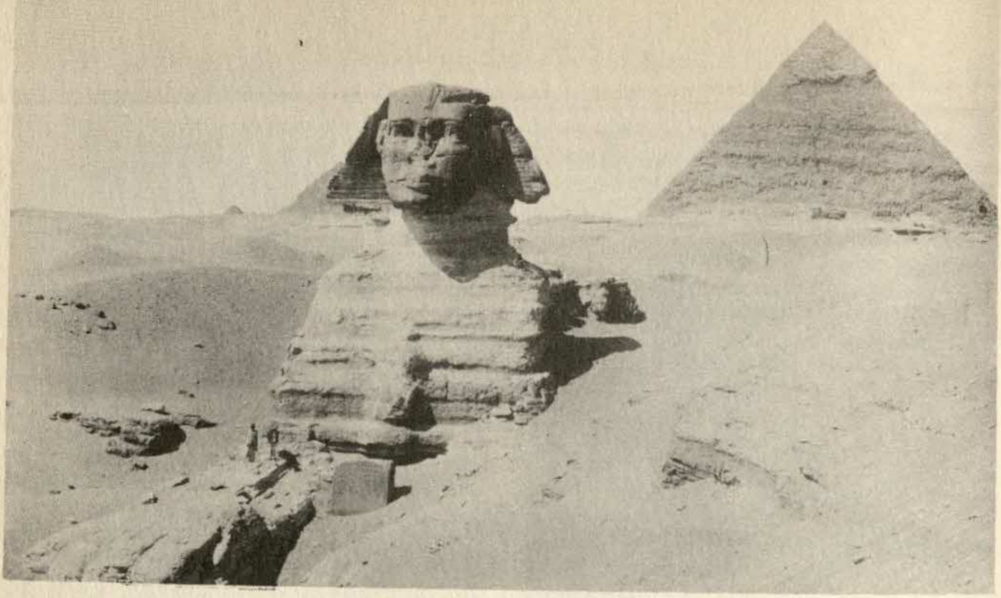
Sphere (*sfēr*), in geometry, a body whose surface is such that every point on it is equally distant from the center. The surface may be generated by the revolution of a semicircle about its diameter, which is called the *axis of the sphere.* A line drawn from the surface to the center is called the *radius.* If the radius of a sphere is r, its surface area is $4\pi r^2$ and its volume is πr^3. Spheres are to one another as the cubes of their diameters. See *Globe.*

Spheroid (*sfē'roid*), a body resembling a sphere in form, but differing from it in not being perfectly spherical. It may be generated by a revolution of an ellipse about one of its axes. If this be the conjugate axis, the spheroid is termed *oblate;* if the transverse axis, it is said to be *prolate.*

Spheroidal State (*sfēr-oid'al stāt*), the form assumed by a liquid when thrown on a surface of highly heated metal. This may be illustrated by placing a small quantity of water upon a highly heated metal surface, when it rolls about in spheroidal balls or masses. The temperature of the drops is a few degrees below the boiling point, owing to the fact that they are not in actual contact with the heated surface, but float on a cushion of nonconducting vapor. Any liquid in the spheroidal state evaporates rapidly by the heat radiated from the surface.

Sphinx (*sfĭnks*), an ancient Egyptian divinity, who personified wisdom and the fertility of nature. This goddess was transplanted to Greece, where it became possessed with malignant power and partook of the nature of a monster. The Sphinx had her seat on a rocky eminence near the city of Thebes, which commanded a pass that the Thebans were compelled to traverse in their way of business, and propounded a riddle to all comers. She tore to pieces those who failed to solve it. King Creon, concerned at the number of people that fell prey to the monster, consulted the oracle of Delphi. He was informed that the Sphinx could be destroyed by solving one of her riddles. Oedipus, being offered the crown and Jocasta in marriage by the king, proceeded to the spot where the Sphinx was seated. The riddle propounded was, "What creature goes in the morning on four legs, at noon on two, and in the evening on three?" Oedipus replied, "Man: since in his infancy he creeps on all fours, in his prime walks on two legs, and when old age has enfeebled his powers, he bring a staff to his assistance, and thus has three legs." The solution being correct, the Sphinx flung herself over the precipice and perished in the abyss below. In Egypt the Sphinx was represented with the body of a lion and the head of a woman.

The *Great Sphinx of Egypt* is a representation of the Sphinx. It is hewn from solid rock, with feet built of masonry. The body of the sphinx is 172 ft. long and rises about 66 ft. above the surface. The head is 30 ft. long and the legs are 50 ft., stretching forward almost parallel to its sides. This structure, being near the pyramids of Gizeh, is thought to have been built about the same time. Other sphinxes occur in different parts of Egypt, some having the



Courtesy Brown Bros., N. Y.

GREAT SPHINX OF EGYPT

heads of rams or hawks; none approaches the Great Sphinx in size. It is supposed to be the work of Chephren, a king of the fourth dynasty.

Sphygmomanometer (*sfĭg'mô-măn-ŏm'ê-tẽr*). See *Blood Pressure.*

Spica (*spī'ḳȧ*), first-magnitude star in the constellation Virgo, nearly 300 light-years distant.

Spice Islands (*spīs ī'lạndz*). See *Molucca Islands.*

Spices (*spī'sẹz*), a class of aromatic and pungent vegetable substances (including herbs), used extensively for flavoring food and in medicine and perfumes. The production of spices is an important industry especially in the warmer regions of Asia and the East Indies, but they are also grown and prepared in the West Indies and tropical America. Spices were brought from Arabia and other countries of the East to Europe in the Middle Ages, and Arabia is still a noted spice-producing and trading country. The aromatic and pungent properties of spices are due chiefly to essential oils, but different parts of various plants produce spices of value.

Cloves are derived from the bud, cinnamon from the bark, pepper and nutmeg from the fruit, and ginger from the root. The clove tree is native to the Molucca Islands, from the flower bud of which the *cloves* of commerce are obtained. These trees attain great age, often yielding products for 75 to 200 years, and their branches grow to a height of 40 ft. Cloves produce the essential oil of cloves, while the blossom of the clove tree yields the spice, which is gathered and dried before quite in full bloom.

The cinnamon tree is native to Ceylon, but the true cinnamon it yields is used mainly in the pharmaceutical and perfume trades. *Cinnamon* is obtained from the inner bark, which is taken from the tree in strips about 4 ft. long and tied into packets or bundles. The bark ferments slightly within a short time, thus causing the inner bark to become separated, which is dried and put in small crates for the market. Commercial "cinnamon" for culinary use is the bark of an unrelated tree, Cassia, more pungent and less sweet than real cinnamon.

Many species of *pepper* have been described, but the common grades of black and white pepper of the market are secured from a climbing shrub, and the berries, about the size of a small pea, grow in pods containing about 15 to

(from top to bottom)
SPICES
Blades of mace, cloves, nutmegs, and sticks of cinnamon

Courtesy Publicity Associates, N. Y.

30 each. Their color, when ripe, is yellowish and, when dried, they turn to a dull black. The *black pepper* usually sold in the market is obtained by crushing or grinding the whole berry, but the outer covering is removed to obtain the *white pepper. Cayenne pepper,* a capsicum, is native to South America, but is grown at present in different sections of the Temperate Zones for both culinary and medical use.

The nutmeg tree is cultivated in the East and West Indies, and yields both the *nutmeg* and *mace.* The fibers surrounding the nut are the mace, which has a reddish color when fresh, and afterward assumes a light brown tinge under exposure to the sun. The kernel or seed within the mace is the nutmeg, which, when shelled, is dried and is then ready for the market. Nutmegs are valued highly in cooking for their aromatic flavor and odor, and both the nutmeg and the mace yield a highly useful oil by compression.

Ginger is prepared from the rootstalk of a tropical plant native to the West and East Indies. It is used in cookery and medicine. White ginger, produced largely in Jamaica, is prepared by scraping off the outer covering of the roots. It is regarded superior to the black or East India ginger, in which the covering is not removed.

Mustard is the seed of the mustard plant. It is crushed and adapted for use as a condiment and for medical purposes. Several species are cultivated, as the white and black mustard native to Asia and Africa. The wild mustard is a very prolific plant in many sections of Canada and the U.S., and the seed is sometimes employed as a condiment by mixing with the seed of cultivated species and not infrequently for medical use, especially as a poultice.

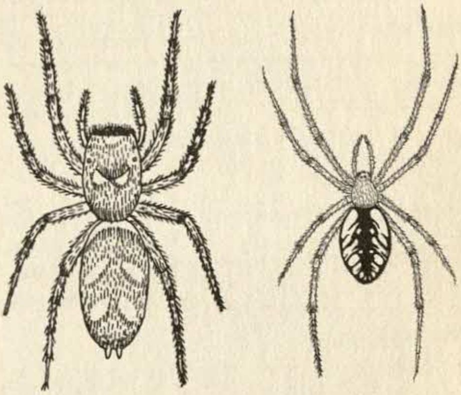
Vanilla is the product of a climbing orchid, the fruit being known as the vanilla bean. It supplies the vanilla of commerce and yields a delicate aromatic odor used in flavoring syrups, ice cream, and confectionery. The plant is native to Florida and to many sections of Asia and the Pacific islands.

Spider Crab (*spī′dẽr krăb*), any crab whose legs are very long compared with its body; they are common on the east coast of the U.S. The largest species known is the giant crab of Japan.

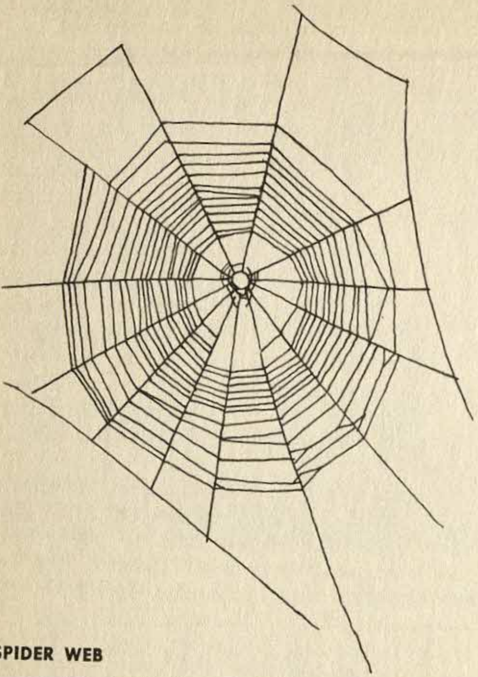
Spiders (*spī′dẽrz*), the dominant arachnids of the order Arăneida, are an extensive and ancient group of land arthropods which produce silk in glands within the abdomen, and, in their wide and proficient use of this material during almost every episode of their lives, have become celebrated for their spinning activities.

They, and such other familiar animals as scorpions, harvestmen, ticks, and mites, and various less well-known creatures, make up the class Arachnida. This name is derived from Arachne, a rash Lydian princess who dared to challenge Athene to a test of skill in weaving, and was transformed into a spider. To primitive peoples, the spider is a creature of mystery and power, and they have little fear of them. Indeed, in Northern Siam various spiders form an essential part of the diet of the Laos, and contribute much needed proteins and fats to their diet. More erudite peoples have developed an aversion for spiders, which is not justified by their venomous properties, and which fails to take into account the very important place they hold in nature. Spiders are the dominant predators of the soil and vegetation, and destroy innumerable noxious insects, in this way helping to maintain a natural balance.

Spiders differ at sight from most arthropods in completely lacking antennae, which are sensory appendages on the head of insects and and crustaceans, often called "feelers." They are only remotely related to insects, which have true wings and only three pairs of legs, whereas spiders and other arachnids have four pairs of walking legs and are always wingless. The body of the spider consists of two principal regions. The front portion, the cephalothorax, is a combined head and thorax, as the name implies, and is provided with a pair of sharp jaws, a pair of leglike appendages called pedipalpi, and four pairs of walking legs. The eyes are usually eight in number and located at the front end of the cephalothorax; but this number is often reduced to six, less frequently to four and two, and in some cave spiders, all are lost. Attached to the cephalothorax by a very narrow waist is the abdomen, a structure which is unmarked by segmentation and usually quite soft, being capable of considerable distention. The spider is an air-breathing animal and has openings to internal book lungs and trachea on the ventral side of the abdomen. At the apical end of the abdomen



JUMPING SPIDER (left); ORANGE GARDEN SPIDER (right)



SPIDER WEB

below are the spinnerets, fingerlike appendages through which issue the liquid silk manufactured in glands within the abdomen, and which are the most important organs in the life of these spinning animals.

Spiders are inveterate spinners of silk and are able to spin at a very early age. After they emerge from the egg-sac, most baby spiders let the breeze pull out silken streamers from their spinnerets and then they fly through the air, a phenomenon called "ballooning." In this manner, they travel great distances, in some cases as far as 200 m. out to sea, and also attain great heights. Spider silk is very fine, frequently 1/100,000 in. in diameter, and is therefore used for cross hairlines or markers in the lenses of certain optical instruments. It is not, however, used in bombsights or fire-control instruments where a complicated pattern is needed. Spider silk is very elastic and second only to fused quartz crystals in tensile strength. The spider spins a dragline thread wherever it goes and thus covers the soil, plants, and buildings with silken threads. When these lines become heavy with dust and lint, they hang from our ceilings as cobwebs. Sometimes, the wind picks up the thick covering of silk on our meadows and drops it on far places like snow, causing "showers of gossamer." Spiders also use silk to line their retreats, and enclose their eggs in a silken cover, often artistically designed, called an egg-sac.

Most interesting of all uses for spider silk, however, is the snare which is spun by the spider to capture its food. The grass spider lays down a flat sheet over the grass and herbs and places a series of lines above to stop flying insects. When they fall on the sheet, the grass spider rushes out and captures them. Tangled webs in the corners of houses are spun by house spiders and many kind of insects blunder into them. Best known of all is the orbweb, which, in the mind of most men, is symbolic of spider, and which is the most highly evolved of all the space webs. Such webs have a framework of dry silk on which are placed spiral turns of sticky silk which entangle flying insects. One of the common and conspicuous orbweavers of the U.S. is the orange garden spider, which spins a zigzag band of white silk through the center of its orb. All the spiders which rely considerably on silk live a sedentary life and remain on or near their webs most of their lives.

Many spiders wander freely about and are able to pursue and capture their food by the chase. Among these vagrants are the wolf spiders, the females of which are often seen carrying their white egg-sac behind them, attached to their spinnerets, or covered over with a layer of baby spiders. The brightly colored jumping spiders are also wanderers, and they have the best eyesight of all their clan. The little males dance and posture in front of the females during their courtship, displaying to the best advantage their ornamented legs and bright bodies.

Spiders live all over the land areas of the world, wherever plants and insects are found. Many of them have become subterranean and dig deep burrows which are lined with silk. The trap-door spiders cap the top of their tunnels with a perfectly fitting trap-door, which is hinged on one side and which can be held down firmly by a determined spider. The purse-web spiders spin a silken tube up the side of a tree and bite through it with their long jaws to capture insects that walk over the tube. Largest of all spiders are the great tarantulas, or bird spiders, which live in the southwestern U.S. and in the tropics of the whole world. Some of them have a body 3½ in. long, and have a leg span of 10 in.

No spider is truly aquatic, but many live on the banks of streams and lakes and run over the surface and dive into the water. The water spider of Europe lives in the fresh water of streams and carries air beneath the surface to its little silken diving-bell domicile. In the security of this retreat, it lays its eggs and hatches out its young, replenishing the air supply by taking occasional trips to the surface. Other spiders live along the seashore and are snug in little airtight tubes when covered over by the tides.

All spiders begin their life as an egg which is enclosed in a more or less durably built egg-sac. The young are tiny replicas of their parents, and attain their full growth gradually, as do grasshoppers and other forms which undergo gradual metamorphosis. The adult males are usually inferior in size to the females, and in some cases are tiny atoms when compared with their great mates. During the pairing, the male must approach the female and gain her recognition of him as a mate rather than as just an interloper. Quite often the male is killed and eaten by the female when she is not ready for mating and sees in him only a morsel of food as suitable as any other. On the other hand, many spiders live together quite amicably, and the male is in little danger from the female. The male transfers the semen to the female receptacles by means of a specially developed organ on the end of the leg-like pedipalpi. Whenever the female lays her eggs, they are fertilized by semen from the stores in her body, and she can call upon this supply several times. Fertile eggs have been laid as much as a year after the initial mating. Most spiders of the Temperate Zone live only one year, but the more primitive kinds live somewhat longer. The large, hairy tarantulas of our Southwest are known to live about 25 years, which is far longer than for any other terrestrial arthropod.

All spiders are predaceous and live on the juices of live animals, which are captured by the chase or by webs. Their prey is subdued by venom from poison glands in the chelicerae or in the head. Almost all spiders are poisonous, but the venom is specialized for small cold-blooded animals and has little effect on mammals and man. The great tarantulas of South America are able to kill frogs, lizards, and even rattlesnakes, and some that live in trees occasionally kill small birds. In a very few instances certain spiders are known to have a venom which differs in quality from that of most spiders, and is capable of causing severe symptoms in mammals and man. The black widows (species of *Latrodectus*) are truly dangerous spiders, which, though they bite rarely and live retiring lives in dark places, are notorious throughout the world, under expressive common names, for their dangerous bite. Although death rarely occurs, the venom so affects the nervous system that grave systemic disturbances and excruciating pains are present in almost every case. No other spiders in the U.S. are capable of doing more than minor local injury to man by their bite.

Spikenard (*spīḳ'närd*), or NARD, an aromatic plant. The roots are from 3 to 12 in. long and send up little spikes bearing purple flowers. The ancients gathered the roots for preparing valuable perfumes to be used at feasts and in baths. The roots still have a wide use in perfumes and in medicine. Christ was anointed with the ointment of spikenard while in the house of Simon in Bethany. The plant is native to India and China, and is found in the Himalayas to elevations reaching 15,000 ft. The name is applied to an American plant of the ginseng family, somewhat resembling the wild sarsaparilla.

Spillville (*spĭl'vĭl*), a village in Winnishiek County in northeastern Iowa. It was founded in 1854 by Joseph Spielman, an immigrant from Europe, and was first known as Spielville, but later the name was Americanized to Spillville. The business section is built around the public square, and the streets are lined with elms. Antonin Dvořák, the composer, spent the summer of 1893 at Spillville, where he made the final corrections on the "New World Symphony." The inhabitants are largely descendants of Bohemian and Swiss immigrants. Population, less than 500.

Spinach (*spĭn'ĭch*), or SPINAGE, a genus of herbaceous plants of the goosefoot family, extensively cultivated in gardens to be used as greens. This product is eaten as a salad, or is boiled and served with butter or a cream sauce. The leaves grow on long stalks and are best when quite young. Spinach is most juicy and best flavored when the growth is luxuriant. It becomes bitter at the appearance of a long stem, which bears spike-formed flowers. Several species are cultivated, among them the prickly, smooth, and Australian spinach.

Spinal Column (*spī'nạl ḳŏl'ŭm*), or SPINE, the backbone of vertebrate animals, which is made up of a series of bones called the *vertebrae*. Each vertebra consists of a solid part, of an open ring, and of three major projections or processes. The human spine has 24 movable vertebrae, 7 of which are known as *cervical;* 12, as *dorsal;* and 5, as *lumbar*. At the base of the spine are 5 false vertebrae, which unite in the adult to form the sacrum, and below them are 4 small bones that unite in the adult to form the coccyx. The vertebrae comprise a succession of rings of bone, within which is a cavity called the *spinal canal*, which extends from the base of the skull to the lower end of the vertebral column. Within the spinal canal is the spinal cord, with its membranes and vessels.

Spinal Cord (*spī'nạl ḳôrd*), the cordlike structure situated in the spinal column of vertebrate mammals, constituting a part of the central nervous system. The spinal cord in man has an expansion just as it starts from the brain, called the *medulla oblongata*. The cord is from 15 to 20 in. long. Its function is to transmit outgoing and incoming nerve impulses, and it is the seat of the centers of reflex action. It is securely lodged within the long cavity of the vertebrae and is protected by a double membrane called the *arachnoid*, within which is the cerebrospinal fluid. A fine tissue, known as the *pia mater*, is within the arachnoid, and surrounding the whole is a tough membrane called the *dura mater*.

The spinal cord differs from the brain in that the white matter is on the outside and the gray matter is within. From the spinal cord spring

31 pairs of spinal nerves. Of this number one pair issues from the *coccyx* and 5 pairs proceed from the *sacral region*. Five pairs are known as *lumbar* and 12 pairs as *dorsal nerves*. Eight pairs in the region of the neck are called the *cranial*, or *cervical nerves*. Each nerve arises by two roots; the anterior is the motory and the posterior is a sensory one. When the anterior root is cut, the power of motion is lost and, when the posterior is cut, that of feeling is destroyed.

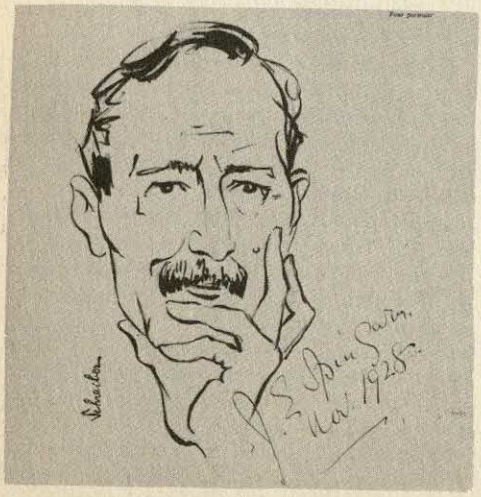
Spindle (*spĭn'd'l*), the slender rod or pin in a spinning wheel, by which the thread is twisted, after the fiber has been drawn from the distaff. It is usually long and slender, and in most cases is made of metal, though formerly it was exclusively of wood. The name spindle is also applied to the pin on which the bobbin is held in the shuttle of a loom, or in a spinning wheel; and, by extension, to any similar slender pin (as distinct, however, from an axle) on which any moving part turns.

Spindle Tree (*spĭn'd'l trē*), or STAFF TREE, the name of a genus of shrubs and small trees, of which about 300 species have been described. The *common spindle* tree is native to Europe, where it is planted for ornamentation in parks and on lawns. The wood is white, has a fine grain, and was formerly used in making spindles and musical instruments. Crayons are made from the charcoal of this tree. A species known as *burning bush*, so called from its bright red fruit, is native to North America. It is a low shrub, and grows chiefly in moist woods. A woody climber, known as the *climbing bitter-sweet*, is one of the species.

Spingarn (*spĭn'gärn*), JOEL ELIAS, author and critic, born in New York City, May 17, 1875; died July 26, 1939. Professor of comparative literature at Columbia Univ. (1909-11), he resigned with the intention of devoting himself to social service work. As chairman of the board of directors of the National Assn. for the Advancement of Colored People (1913-19), he instituted the Spingarn Medal which has been awarded to one outstanding Negro annually since 1914; he subsequently became treasurer (1919-30) and president (1930) of the association. He served in World War I. In 1919, he became associated with the publishing house of Harcourt, Brace & Co. He wrote many penetrating works on literary criticism, including "A History of Literary Criticism in the Renaissance" (1899), "Creative Criticism" (1917), "Poetry and Religion" (1924), "Creative Criticism and Other Essays" (1931), and contributed to the "Cambridge History of English Literature."

JOEL ELIAS SPINGARN

Courtesy Harcourt, Brace & Co., N. Y.



Spinner (*spĭn'ẽr*), FRANCIS ELIAS, financier and politician, born in Mohawk, N.Y., Jan., 21, 1802; died in Jacksonville, Fla., Dec. 31, 1890. He was carefully educated and, in 1824, engaged in the confectionery business at Herkimer, N.Y. He was made auditor of the port of New York in 1845 and served as a Democrat in the U.S. Congress, 1855-61. In the latter year he was appointed treasurer of the U.S. and served in that capacity until 1875. His long service in the treasury caused his peculiar signature, which he cultivated in order to prevent counterfeiting, to become known the world over.

Spinning (*spĭn'ĭng*), the art of combining individual animal or vegetable fibers so as to form continuous yarn or thread. The methods of spinning differ somewhat, according to the fibers used, which may consist of cotton, flax, jute, silk, or wool. Spinning is an industry that has come down to us from ancient times, and the methods formerly practiced in Egypt are still in vogue in many countries, but they have been largely replaced by modern machinery. The ancients employed the spindle and the distaff, and all the spinning they did was by hand. A quantity of the prepared material was loosely wound upon the distaff, held in the left hand, and the thread was attached to the spindle, which consisted of a tapering piece of wood. The spinster produced a rotary motion of the spindle by a twirl of the hand, and at the same time drew out between the thumb and forefinger of the right hand a supply of the fibers until the motion of the spindle was exhausted. The spindle was drawn in as soon as the movement stopped, when the thread was wound or attached in the same manner, and the process was repeated.

A spinning wheel was invented at Nuremberg, Germany, in 1530, but it was used only for flax spinning. Later it was improved to spin other materials, and may be said to have suggested the spinning jenny invented by James Hargreaves in 1764. The advantage of the spinning jenny was that it employed a number of spindles, while the spinning wheel had only one. However, modern machinery has replaced it, and now many machines of different construction are in extensive use. Spinning machines employed at present are constructed so as to turn out a particular yarn, which permits of greater simplicity than where regulating devices are employed for adjusting so as to finish products of different grades.

Spinning Jenny (*spĭn'ĭng jĕn'ȳ*), the name of the earliest machine for spinning more than one thread at a time. It was invented by James Hargreaves, in 1764, and soon displaced the spinning frame constructed by Arkwright about the same time. The spinning jenny had a wheel or cylinder to be turned with the right hand, while the left was used to draw out the rovings of the material to be spun, which were twisted as the wheel turned. A piece of wood worked by the toe caused a wire to be let down, and by this means the threads were pressed out and wound upon bobbins. At first the jenny had eight spindles, but as hand power was replaced by mechanical power, the number was increased from time to time, until as many as 120 were worked on one machine. Samuel Crompton, in 1779, invented a machine that combined the principles of both the frame and jenny. His invention, known as the *mule jenny,* superseded all others, and was the first to employ the general principles now employed in all classes of spinning.

Spinning Wheel (*spĭn'ĭng hwēl*), a machine for spinning fibers into thread. It is an improvement on the ancient spindle and distaff in that the work is done through the agency of a wheel and treadle. It consists of a frame, in which the spindle is made to revolve by mechanical action, either by the hand or the foot, though the latter is used most extensively. In this machine the spinster guides the wool or other fiber with the hand, and the spindle revolves rapidly through the impulse imparted by a band from the treadle to the wheel. By carefully drawing the thread by means of the hands, it is possible to regulate the degree of fineness as well as its uniformity.

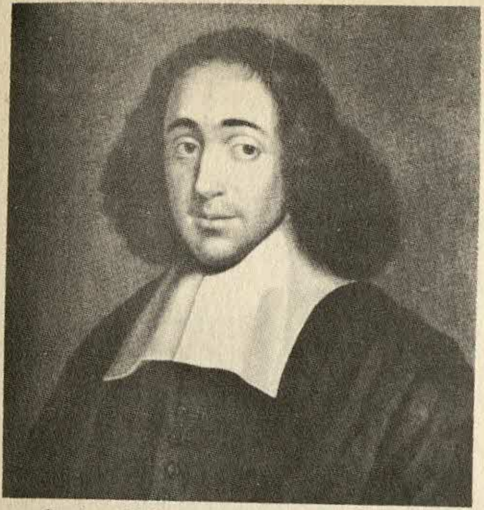
Spinola (*spē'nō-lȧ*), AMBROGIO DI (MARQUÉS OF LOS BALBASES), soldier, born in Genoa, Italy, in 1569; died in Piedmont, Sept. 25, 1630. Descended from a noble Italian family, he became distinguished as a military leader of the Spanish forces in the Low Countries, of which he was made chief commander in 1603. The following year he reduced Ostend, which had been besieged unsuccessfully for two years by Archduke Albert of Austria, thus attaining to great renown. Maurice (*q.v.*), Prince of Orange, was his opponent, against whom he fought with indecisive results until 1609, when an armistice was concluded. Spinola was sent with a Spanish army into the Palatinate of the Rhine in 1620, where he won a number of important victories, and the following year again invaded the Netherlands. His principal conquests were the capture of Jülich in 1622 and that of Breda (*q.v.*) in 1625, reducing the latter after a ten-month siege. Subsequently he had command of the Spanish troops in Italy, his death occurring while the siege of Casale in Piedmont was in progress.

Photo by Hartmann, courtesy Swiss Federal R. R.

SWISS SPINNER AT THE WHEEL

Spinoza (*spĭ-nō'zȧ*), or DE SPINOZA, BARUCH, best known as *Benedict Spinoza,* philosopher and author, born in Amsterdam, Holland, of Jewish parents, Nov. 24, 1632; died at The Hague, Feb. 21, 1677. He was educated to become a rabbi, but because of his liberalism he was soon excommunicated by his congregation (1656) and left Amsterdam, ultimately settling in The Hague in 1671. There he began to write, supporting himself by grinding optical lenses. After the publication of his *"Tractatus Theologico-Politicus"* he was offered a professorship at the Univ. of Heidelberg, but he declined it because he wished to preserve complete intellectual independence. He refused a pension offered him by Louis XIV of France for the same reason. He died of tuberculosis, almost a pauper.

Spinoza's philosophical system has often been called a system of monism, or of substance, or of pantheism. These definitions are misleading, however, because they try to capture a complicated and original system of philosophy with labels which were not even originated until after his time. The



Courtesy Netherlands Information Bureau, N. Y.

BARUCH SPINOZA

fact that Spinoza was influenced by the Talmud, the Kabbala and the writings of Maimonides, and Descartes explains to a considerable extent his approach and method, but it does not give substantial help in explaining the specific characteristics of his system and the content of his thought.

Spinoza is essentially not only analytic, like Descartes, but always strives for synthesis, for aiming at a fundamental, absolute reality, which he calls substance. This substance he does not subdivide into mental and material substance, as Descartes did, but conceives of it as *one* reality. According to him, this reality or substance can be explained only by itself. It is, in itself, its own first cause (*causa sui*), since there can be only one first cause, and spirit and matter are not two substances, but only attributes of the one substance. Spirit is characterized by thinking and matter by expansion, but spirit has no expansion and matter no thinking. The substance itself has all attributes, including that of infinity in both the temporal and spatial meanings of the word, and that is what Spinoza calls God.

Spinoza may understandably be called a monist in contrast to, for example, Descartes, whose theory of the contradiction of matter and mind makes him a dualist. However, Spinoza can by no means be called a monist in the modern sense, which makes the term identical with materialist.

Since God is the only substance for Spinoza, the same law must govern the world of expansion (matter) and the world of thinking (mind). Thus, the individual elements of the world of expansion—individual material things—must be governed by the same relationship as the individual elements of the world of thinking—individual ideas. As in the world of expansion nothing happens without cause, so in the world of thinking no act of willing can originate without a specific motive. One first cause underlies the chain of events in both worlds. Nothing is good or bad, useful or detrimental, but everything is simply necessary since it follows from the first cause. The dual nature of God, as expressed in the world of matter and in the realm of mind (which are not contradictions, but attributes of the same substance) includes this continuous, eternal, and infinite relationship between cause and result, physically and mentally alike.

Since for Spinoza there exists only one way of connecting facts, physical or mental, with each other, it was only natural for him to pattern his main work, "Ethics" ("Ethics Demonstrated in Geometrical Order," 1677), on the style of a geometrical treatise. For him philosophy and its special branch, ethics, are not simply philosophy but philosophy and science at the same time. Thus, he can order philosophical ideas in a scientific (geometrical) manner. Definitions, postulates, axioms can be connected with each other, and descriptive and normative methods can be linked. The theorems which constitute his philosophical system are deduced from definitions and axioms in geometrical fashion. To him, philosophy meant the attempt to build a theoretical order or structure of positive knowledges, and he believed that it could be achieved by using the geometrist's techniques. The ability of the mind to know and the objective criteria of truth defined, for him, the tasks of philosophy and science alike.

The all-encompassing nature of ultimate reality, in Spinoza's concept, creates a kind of view which is related to what is today called psychophysical parallelism (*q.v.*), without the latter's materialistic connotations.

Besides the "Ethics," Spinoza's writings include "Treatise on the Improvement of the Understanding," "Short Treatise on God, Man and His Well-Being," and the incomplete "Political Treatise."

Spiral (*spī'ral*), the locus of a point revolving about a fixed point while approaching or receding from this center point according to some mathematical law. The equations of spirals are frequently expressed in polar form. Archimedes discovered and described the Spiral of Archimedes in his work "On Spirals," written in the 3rd century B.C. It is the locus of a point moving uniformly around a fixed center and away from the center at a uniform rate. Other spirals are the logarithmic, hyperbolic, reciprocal, and parabolic.

Spiral Nebula (*spī'ral nĕb'ū-lȧ*). See *Nebula.*

Spirea (*spī-rē'ȧ*), a large genus of shrubs native to the temperate regions. A species known as *bridal wreath,* having white or pink flowers, is cultivated extensively in gardens and parks. Other varieties include the *meadowsweet, hardhack, plum-leaved,* etc.

Spiritism (*spĭr'ĭt-ĭz'm*), the belief that the human soul survives in the form of spirits with whom man can communicate, therefore sometimes wrongly called *spiritualism* (*q.v.*). It also signifies the various systems of gaining contact with these spirits, which may be the surviving souls of deceased persons, ancestors, celestial beings, daemons, or even the souls of animals. Finally, spiritism refers to the whole realm of parapsychic phenomena, *i.e.,* the research into all happenings which cannot be explained by natural causes.

Most spiritistic concepts are based on the existence of a "medium," a specifically gifted person whose soul, according to the belief of the spiritists, is connected with his or her body in a looser way than are those of normal people. Thus it is possible for the medium to separate body and soul so that his soul can make contact with the spirits, who are always a great distance away (see *Telepathy*). Furthermore, these mediums can manifest the spirits, so that they materialize as faces, hands, or whole bodies. Although it has been alleged that the spirits can be photographed, it has been proven beyond doubt that these photographs were obtained by fraudulent means.

A community of like-minded people are supposed to be able—by using certain methods—to extract utterances from spirits of the deceased. These spirits will signify their presence by making a table knock or writing down answers to questions or moving pieces of furniture or elevating people apparently in defiance of the laws of gravity.

The mere fact that usually certain preparations, especially darkness, are necessary for communicating with spirits, and furthermore, that all possible controls are mostly excluded, that the answers of the so-called spirits are often as ridiculous and uneducated as the jokes they play on the participants of the session are childish, should make all thinking people suspicious of such alleged communication. On the other hand, certain facts, like the elevation of living people, cannot be denied. However, that such events took place does not justify any belief in spirits. It depends on personal conviction whether these phenomena are explained religiously, as in the lives of the saints, or as manifestations of natural forces not yet discovered and explained.

The various societies for psychical research, of which two of the most important are the English Society, founded in 1882, and the American Society, founded by William James in 1885, try to make investigations into such matters on a scientific basis, dealing essentially with the problems of telepathy, of mediumship, of precognition and clairvoyance, and of the influence of human will upon inanimate matter, as, for example, its influence on playing cards or dice.

Despite the fact that the belief in spirits is as old as mankind, that medicine men, sorcerers, wizards, priests of any creed, have often pretended to be able to conjure spirits and to make contact with the deceased, spiritism began in its modern form only in 1848, when the American John D. Fox and his wife claimed to have been disturbed by strange sounds and rappings at the door and different parts of their house. Fox and his daughters afterward became mediums and gave seances in many cities of the U.S. Spiritualistic circles were organized soon after, and many adherents rapidly joined. In 1855, D. D. Home made an impressive tour of the European continent representing spiritualistic principles and attained a somewhat dubious immortality in Robert Browning's poem, "Mr. Sludge, the Medium." From the U.S., spiritism spread to Europe during the second half of the 19th century. Even modern movements like anthroposophy and theosophy (*qq.v.*), which were influenced by Eastern religions and philosophies, show a leaning toward spiritism. See also *Doyle, Sir Arthur Conan; Lodge, Sir Oliver Joseph.*

Spirit of St. Louis. See *Aviation; Lindbergh, Charles Augustus.*

Spiritualism (*spĭr′ĭ-tûl-ĭz′m*), a theological and philosophical term which has three different meanings. (1) In *philosophy,* spiritualism is the doctrine that Spirit is the first cause of the entire Universe, that it permeates everything, and that it explains the existence and the form of everything. This Spirit, which various philosophical and theological systems also call Pneuma or Nous or Reason or Logos, represents only the true reality and not the so-called material appearances of things. Thus, logically, spiritualism is the viewpoint which stands in exact contrast to materialism (*q.v.*). The belief that the human soul is completely nonmaterial and absolutely spiritual (see *Pneumatism*) is sometimes also called spiritualism. (2) As a *theological term,* spiritualism signifies the belief that the Holy Spirit influences the created world directly, and emphasizes the special importance of the Gospel according to St. John in this question. It represents a basic concept in the teachings of the mystics, who believed that worship and religious experience are identical with the communion of the individual with the Holy Spirit. (3) Spiritualism as a modern term is often used to describe, although incorrectly, what is correctly called spiritism (*q.v.*).

Spirochaeta (*spī-rȯ-ḵē̆′tȧ*), in medicine, family of bacteria, characterized by flexible spiral filaments, which cause various diseases. One species, *treponema pallidum,* causes syphilis.

Spirometer (*spî-rŏm′ê-tẽr*), an instrument for measuring the capacity of the lungs, especially the volume of air which may be expelled after the deepest possible inspiration. Several devices of this kind are in use. The most common form consists of a vessel with a float set in the top, which it fits closely, and the air is blown through a tube below,

SPITSBERGEN

Courtesy Brown Bros., N. Y.

causing the float to rise. An index or graduated scale indicates the rise in inches, so that it is possible to determine the number of cubic inches of air exhaled.

Spithead (*spĭt′hĕd*), an anchorage or roadstead off Portsmouth, England, situated in the channel which separates the Isle of Wight from the mainland. It is so named from the Spit, a sand bank, which extends a distance of 3 m. along the south shore of England. The roadstead is about 4 m. wide and 14 m. long, and is a favorite anchorage for the navy of Great Britain. It is strongly fortified, and is known as the *King's bedchamber,* owing to its security.

Spitsbergen (*spĭts-bĕrg′ẹn*), an island group in the Arctic Ocean, belonging to Norway since 1920, when it was renamed Svalbard. The area is about 24,294 sq. m. Spitsbergen, Barents, and Northeast Land are the chief islands. The group is situated 350 m. east of Greenland and about the same distance north of Norway. Predominantly arctic, the climate is extremely cold, and in the two summer months the thermometer rarely rises more than 35° above zero, though in this short season fully 100 species of plants spring up and ripen their seeds. About 50 of these plants have been described, of which the most vigorous are not over 4 in. high. The coast lines are generally icebound on the eastern side, while the western coast is more or less tempered by the Gulf Stream. Little is known of the interior, but it is certain that the snow line is only a short distance above sea level on the interior mountains, which rise to heights of about 4,000 ft. The sun is below the horizon for four months in the winter, from Oct. 22 to Feb. 22. Among the animals native to these islands are several species of bears, foxes, and reindeer. Numerous sea fowls are abundant in the fall season. Several small settlements exist, and many explorers, hunters, and tourists frequent the islands in the open season. The Vikings discovered the island group in 1194. Claimed by Germany and Russia before World War I, Spitsbergen was placed under Norwegian sovereignty by international agreement in 1920, and Norway took formal possession in 1925. In August-September, 1941, Spitsbergen was occupied by a force of Canadians, British, and "Free Norwegians." During World War II the Allies established a military base on Spitsbergen. Bituminous coal deposits are worked on the islands. Population, *ca.* 2,200.

Spitteler (*shpĭt′ẹ-lĕr*), CARL, author, born Apr. 24, 1845, in Liestal, Switzerland; died Dec. 29, 1924, in Lucerne, Switzerland. He studied law and theology and tutored for many years before publishing his first important book, an epic poem, "Prometheus and Epimetheus," in 1881. Two years later "Extramundana," a book of fables in rhyme, appeared. Although he continued to write poetry, he worked as a journalist from 1885-92, but after the latter year he devoted himself solely to writing. His most important work, "Olympian Spring," was published in the years between 1900-06. In 1919, he won the Nobel Prize for literature "in appreciation especially of his powerful epic, 'Olympian Spring.'" In addition to his poetry, he wrote essays, several novels, and autobiographical reminiscences of childhood.

Spitz (*spĭtz*), the name of a breed of small dogs, employed chiefly as a pet. It is about the size of the spaniel, has a pointed face, and is usually white or whitish in color. This class of dogs is sometimes called *Pomeranian,* owing to its being raised extensively in Pomerania, Germany. It is not serviceable for any kind of work, but some strains are quite beautiful.

Spleen (*splēn*), or MILT, an organ found only in vertebrate animals. It is situated between the cardiac end of the stomach and the diaphragm. In man the spleen varies more in size and weight than any other organ, though its usual length is about 5 in., and its weight 3 to 6 oz. It is a vascular or ductless gland, and the surface is covered with the peritoneum. The color is dusky red. It increases in size after a meal, and in about five hours returns to its normal form. Its functions are believed to be connected with digestion, but its exact purpose is not known. The spleen has been removed from man without causing harmful results.

Splügen (*splü′gęn*), a pass in the Alps of Europe, leading from the canton of Grisons, in Switzerland, to Lombardy, in Italy. The highest point in the pass has an elevation of 6,946 ft. above the sea.

The present pass was completed in 1823, when the Austrian government reinforced it with numerous concrete galleries as protection against avalanches.

Spofford (*spŏf′ẽrd*), AINSWORTH RAND, librarian, born in Gilmanton, N. H., Sept. 12, 1825; died Aug. 11, 1908. He received a classical education by private instruction. After establishing a book-selling establishment in Cincinnati, he became an editorial writer on the Cincinnati *Daily Commercial,* in 1859, and in 1861 was made assisitant librarian of Congress. He was appointed chief librarian in 1864, and as such published annually for many years the *American Almanac.* The library contained about 70,000 volumes when he was put in charge, but within a period of 35 years it was enlarged to over 750,000 volumes, and many manuscripts and pamphlets were added. He published "Library of Choice Literature," "Practical Manual of Parliamentary Law," "Library of Historic Characters and Famous Events," and "Library of Wit and Humor."

Spoils System (*spoilz sĭs′tem*), a practice of making appointments to public office not on the basis of merit or fitness, but on that of party or factional affiliation or personal gain. In the U.S., it arose (1829) during the administration of Andrew Jackson. Jackson was motivated in permitting this practice by the theory of rotation in office, for which some defense was possible at that time. The system reached its highest development in the 20 years following the Civil War. After the enactment of the Pendleton Act in 1883 the spoils system gradually gave way to the merit system and patronage was eliminated from many positions in the Federal service. Today many states have complete merit systems. Two developments greatly aided in the elimination of the spoils system: (1) the emancipation of the schools from municipal machines; (2) the professionalization of the public service.

Spokane (*spō-ḳăn′*), county seat of Spokane County, Washington, 300 m. E. of Seattle. It is situated on the Spokane River and the Great Northern, the Northern Pacific, the Chicago, Milwaukee, St. Paul & Pacific, the Union Pacific, and the Canadian Pacific R.R.'s. About 40 sq. m. are included in the tract lying within the city limits, of which the surface is greatly diversified. In the northern part, lying along and north of the river, the surface is gently rolling, but the southern section is characterized by a series of cliffs and lava formations. The river flows in a deep gorge, and descends 142 ft. by a series of falls, affording immense water power for manufacturing purposes. Many substantial bridges span the river within the city limits.

The finest residential section is in the southern part, occupying the summits of a beautiful range of hills, which overlook the city and an extensive region of the surrounding country. As

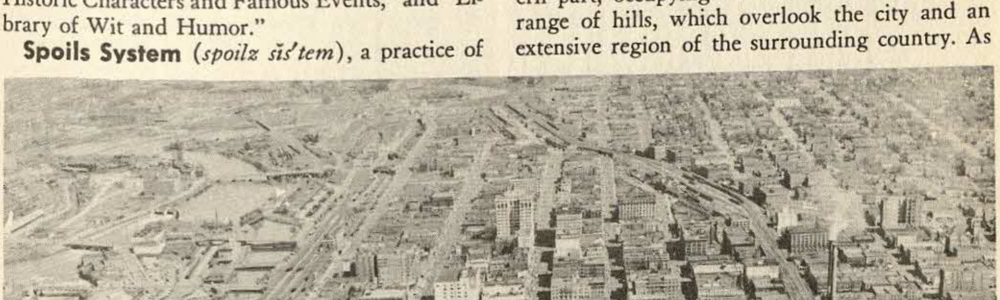


Photo by Wallace Gamble, Spokane, Wash.

AIR VIEW OF SPOKANE

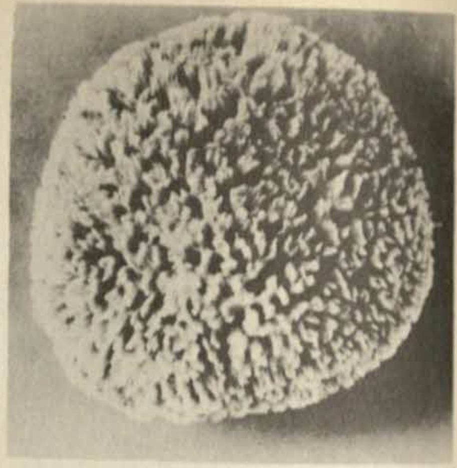
a whole the architecture is modern and substantial. Outstanding features of the city include the Spokane Art Center, the Public Museum, Our Lady of Lourdes Cathedral, the oldest Catholic church in the region, the Monroe Street bridge, whose 281-ft.-long center span makes it one of the world's largest monolithic concrete arches, and Ft. George Wright. Spokane is the seat of Gonzaga Univ., which has a student enrollment exceeding 1,300, and Whitworth Coll, with about 800 students. Scenic areas in the vicinity of Spokane include Deep Creek Canyon and Downriver Park, both of which have scenic drives for motorists, and Cliff Park, overlooking the city.

It is a territory richly endowed with natural resources. Agriculture, livestock, orchards, mines and metals, and the large-scale production of hydroelectric power contribute to its expanding development. Flour, furniture, marble and granite, pottery, brick, terra cotta, clothing, and canned foods are also produced here.

Spokane is the gateway to the Grand Coulee Dam and the Columbia Basin irrigation project. Intercommunication is provided by interurban bus lines, which have branches to all important cities and towns in the vicinity.

The region was settled in 1871, though trappers, miners, and missionaries had passed through it since 1810. The town itself was founded in 1878, when it was called Spokane Falls, and incorporated in 1881, the year that marked the completion of the Northern Pacific R.R. to the city. In 1890 the name was changed to Spokane. A fire destroyed much of the city in 1889, but it was soon rebuilt. Population, 1950, 161,721.

Sponge (*spŭnj*), an animal of the phylum *Porifera*, sessile, aquatic, with but few specialized organs and tissues, having numerous pores in the body wall which admit water into an inner chamber called the *gastral* or *cloacal cavity;* the larger surface openings, called *osculum*, furnish outlets. Many species of sponges, differing widely in form and structure, have been described by naturalists. Their close resemblance to vegetable forms long caused sponges to be regarded as members of the vegetable kingdom, but their animal nature is evident from internal structure, and from the delicate skin surrounding the body. Aristotle was first to recognize the sponge as an animal, but it was not until 1825 that science accepted this theory. They are mostly marine. The largest forms are common to the tropical seas, and they gradually decrease in size, in number of species, and in population toward the colder zones. They grow in both deep and shallow water and are fixed in mud or to rocks at the bottom. Many types encrust coral or limestone; some bore into shells of mollusks. There are about 3,000 living species and a large number of fossil forms.



Courtesy Sponge Institute, Wash., D. C.

SHEEPSWOOL SPONGE

The body is composed of an internal skeleton, or framework, and a gelatinous substance called *flesh*. In the skeleton are many pores which open into much-branched canals passing into ciliated chambers, and during life the jelly flesh envelops all internal parts. This fleshy substance resembles a peculiarly formed protoplasm which, when taken out of the water, has a liver color and becomes sticky. These animals feed upon the minute organisms found in the water, which constantly circulates through the pores, circulation being maintained by cell action. New individuals are produced by internal and external budding and by spermatozoa. In the early larval stage the animal is free-swimming but soon settles down to become permanently fixed to a sessile state of life. Among the species best known are the *sheepswool*, the *yellow*, the *velvet*, the *glove*, the *bath*, and the *grass* sponges.

Courtesy American Museum of Natural History, N. Y.

BATH SPONGE

Sponges are obtained by diving. The diver is provided with diving apparatus and loosens the growing sponges by means of an instrument called a sponge hook. However, in water less than 15 ft. deep, the sponges may be secured from a boat at the surface. One man manages the boat, while another, called the *hooker,* watches the bottom through a glass-bottomed bucket which is held in one hand, while with the other hand he manipulates a long pole to which is attached a three-pronged hook. When a sponge is found, it is detached from the bottom with the hook and is drawn to the surface. The fresh sponges are killed by more or less prolonged exposure to the air and the fleshy matter is separated from the skeleton by burial in the sand for several days.

On board the sponge boats, which go out sponging from 20 to 30 days at a time, the dead sponge is piled on deck in heaps covered with tarpaulin to allow the flesh to become putrid. When ripe, a process of scraping of the outer skin and wringing out the decayed animal matter takes place; then they are strung on long strings and hung to semidry. In this condition they are brought to the sponge exchange, where they are sold at auction. Merchants acquiring sponges from the exchange then wash, trim, and prepare them for the market. During World War II, the armed services bought the greatest part of the sponges produced, making this commodity scarce in civilian markets.

Among the uses of sponges are those connected with the toilet and bath, washing paint work, stuffing mattresses, and filtering. Valuable sponge fisheries occur in the West Indies, at Key West, off the west coast of Florida, and in the Mediterranean.

Tarpon Springs, Fla., is the largest sponge center in the world, with an annual business running into millions of dollars. This sponge center was started early in the 20th century by a Greek sponger who brought with him divers and a boat from Greece. The Tarpon Springs sponge fisheries are still worked by Greeks in Greek tradition and with Greek-type outfits. The workable sponge beds of Tarpon Springs extend 30 m. from shore and 300 m. up and down the coast.

The finest sponges come from Smyrna. Those used for washing purposes are obtained chiefly in the Bahamas and Florida. Sponge culture has been successfully introduced in several tropical regions. Fossil sponges occur in various strata of limestone, being evidence that this group of animals lived before the oldest Silurian epoch.

Spongioplasm (*spŏn′jĭ-ô-plăz′m*). See *Protoplasm.*

Spontaneous Combustion (*spŏn-tā′nē-ŭs kŏm-bŭs′chŭn*), a term applied to the ignition of mineral and other substances without the application of fire. This phenomenon frequently causes fires in machine shops and buildings. Phosphorus in a dry state may ignite spontaneously in a temperature as low as 70°. Charcoal in a dry state does not undergo spontaneous combustion, but when oils are added it becomes heated and takes fire, while coals associated with pyrites ignite easily in a wet condition. Fires are frequently caused by placing large quantities of moist hay in a mow, the ignition resulting from fermentation accompanied by considerable heat. In like manner fire may be caused by the fermentation of rags, tow, cotton, straw, flax, and other vegetable matter. The self-ignition of cotton waste used in cleaning machinery is common, especially where the cotton product is mixed largely with oily substances.

Spontaneous Generation (*spŏn-tā′nē-ŭs jĕn-ẽr-ā′shŭn*), or ABIOGENESIS, the term applied to an obsolete theory that living forms may originate without the intervention of living matter.

Spoonbill (*spo͞on′bĭl*), a genus of wading birds of the heron family, having a resemblance to the stork and the ibis. They are so called from the large size of the bill, which is flattened and widened at the tip. These birds are widely distributed, usually frequenting the mouths of rivers and the seashore, but the species are not numerous. The *roseate spoonbill* is native to the U.S. and is found in many sections of the warmer and tropical parts of America, especially in Florida and the Carolinas. The color is almost pure white on the neck, with a rosy tinge on the body, which is about 30 in. long, and the bill attains a length of 8 in. It has a wingspread of 50 in. This class is usually seen in flocks feeding in wet and marshy places, where these birds catch worms, insects, fish, and small crustaceans. The *white spoonbill* is native to Europe, moving northward in the spring and to the regions of the Mediterranean on the approach of fall. The color of the body is almost a pure white, but there is a tinge of yellow on the breast, while the bill and legs are black. A kind of sturgeon quite common in the Mississippi and several of its tributaries is known by the name of *spoonbill.* The same name is sometimes given to the *shoveler duck.*

Spooner (*spo͞on′ẽr*), WILLIAM ARCHIBALD, teacher and clergyman, born July 22, 1844, in London, England; died Aug. 29, 1930, in Oxford, England. He was educated at New Coll., Oxford, and remained connected with New Coll. until he retired in 1924, being named fellow in 1867, lecturer in 1868, tutor in 1869, dean in 1876 and warden in 1903. He was ordained deacon in 1872 and priest in 1875 and New Coll. was his parish. Although Spooner wrote biographies of Bishop Butler (1901) and William of Wykeham (1909) and edited "The Histories of Tacitus" (1891), he is chiefly known for what came to be called, after him, a "Spoonerism," an accidental transposition of sounds, usually initial, in two or more words. Although there is no doubt that Spooner was frequently guilty of Spoonerisms, there is also no doubt that many more have been attributed to him than he actually made. The "Dictionary of National Biography" cites as his most famous Spoonerism, "Kinquering kongs their titles take."

Spoon River Anthology (*spōōn rĭv′ẽr ăn-thŏl′ō-jȳ*), a famous book of poems by the American writer, Edgar Lee Masters (*q.v.*), published in 1915. It consists of free-verse epitaphs, echoing the satiric epigrams of the "Greek Anthology," which ironically emphasize the hiatus between outward appearances and inner lives in a small Illinois town.

Spore (*spōr*), in biology, an asexual specialized reproductive cell. See also *Asexual Reproduction.*

Sport (*spōrt*), an athletic pastime. The term is also applied to certain other forms of recreation such as hunting and fishing. See *Archery; Athletics; Baseball; Basḳetball; Bowling; Boxing; Fencing; Football; Golf; Hocḳey; Hurdle Race; Lacrosse; Lawn Tennis; Polo; Riding; Rowing; Sḳate; Sḳi; Swimming; Tennis; Wrestling.* See also *Olympic Games.*

Spotswood (*spŏts′wŏŏd*), ALEXANDER, soldier and colonial governor, born at Tangier, Africa, in 1676; died June 7, 1740. He entered the British army and served with the Duke of Marlborough at Blenheim, where he was wounded. In 1710 he went to Virginia as lieutenant governor and was active in promoting William and Mary Coll. He was removed from office in 1722, but later served as deputy postmaster general. He took an active part in promoting the cultivation of tobacco and favored making tobacco notes a medium of exchange. In 1740 he was ordered to the West Indies as a major general, but died at Annapolis, Md., before embarking.

Spotsylvania Court House (*spŏt-sĭl-văn′yạ ḳōrt hous*), the scene of noted Civil War engagements, in a village in Virginia 45 m. N.W. of Richmond. The fighting here formed part of the Wilderness campaign, which took place during May 1864 between the armies of Gen. Grant and Gen. Lee. After the battles of the Wilderness (May 5-7), about 10 m. W. of Fredericksburg, Lee anticipated Grant's tactics and moved his Confederate army to Spotsylvania Court House, where he successfully repulsed the Union attack of May 8 on his lines. Grant repeated the assault and compelled Lee to withdraw to his inner line of entrenchments, south of the North Anna River, an impregnable position that Grant made no attempt to attack. By May 21, the two armies were moving toward Richmond, and they fought again on June 3 at Cold Harbor (*q.v.*), after which inconclusive battle Grant went on (June 12) to threaten the Confederate capital.

Spotted Fever (*spŏt′ĕd fē′vẽr*). See *Typhus.*

Sprague (*sprăg*), FRANK JULIAN, electrical engineer and inventor, born in Milford, Conn., in 1857; died on Oct. 25, 1934. Originally an assistant to Thomas Edison, Sprague became an inventor in his own right and is known as "the father of electric traction." Among his inventions are the high-speed electric elevator, the high-tension direct-current electric railway, automatic electric signal and train-brake controls, and many other devices. He founded the Sprague Electric Railway & Motor Co. (1884) and installed the first modern trolley in Richmond, Va. (1887). He served as consultant to the General Electric Co. and other corporations, was president of the American Inst. of Electrical Engineers (1892-93), and later of the American Inst. of Consulting Engineers.

Sprain (*sprān*), or STRAIN, a violent stretching or wrenching of tendons or ligaments of a joint, with or without the rupture of their fibers or the displacement of the bones. Sometimes sprains are as serious and lasting as dislocations, especially if care is not exercised in the use of the part before the swelling and inflammation have fully subsided. Sprains of the back are the most serious, while those of the knee or ankle are quite common and painful.

Sprat (*sprăt*), or GARVIE, the name of a small fish of the herring family, found in large numbers in the Atlantic waters of Europe. It is about 6 in. long and is frequently canned and sold as a sardine. The true sprat is not found in America, but several small fishes common to the southern part of the U.S. are known by that name.

Spring (*sprĭng*), a flow of water from the interior of the earth, caused principally by the water resulting from rain or snow. When rain falls on a porous soil it is rapidly absorbed, and a spring results from the water's running along an inclined layer of clay or hard rock until it emerges at some lower level. Springs are caused in some localities by water being forced upward from the reservoirs into which it has collected, principally by the pressure of compressed gas, highly heated steam, or a communicating column of water. In hilly and mountainous regions springs result largely from the water's soaking into the porous upper soil and continuing downward until it is intercepted by an impervious stratum, along which it runs until the layer crops out on the hill or mountain slopes. Springs in plains regions are formed principally by the action of gases or the pressure of other bodies of water.

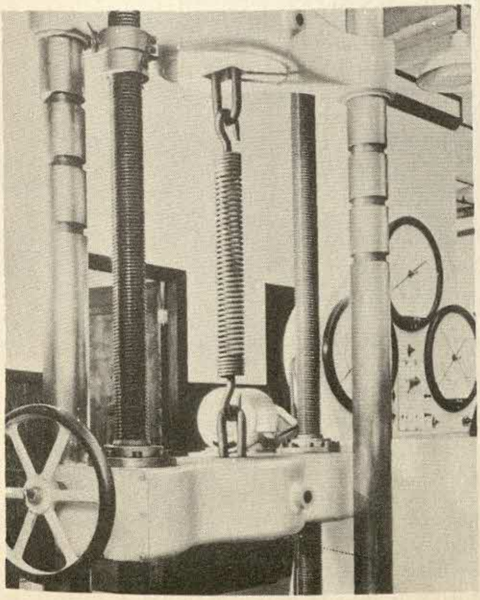
Springs are commonly divided into variable and intermittent. *Variable springs* are influenced by the amount of rainfall, varying at different seasons, but they do not cease flowing at any period of the year, while *intermittent* *springs* flow only a short time after wet weather, drying on the appearance of the dry season. *Artesian*, or *flowing*, wells result when a hole is bored into the earth's crust to form an opening for the escape of water from a reservoir situated on a higher elevation. *Hot*, or *thermal, springs* result from water flowing over a portion of the earth's crust that is highly heated, and *geysers* result from volcanic action or the pressure of interior gases. *Mineral springs* occur where the water soaks through or flows over mineral deposits, such as lime, silicon, sulphates, salt, carbonate of iron, and carbonic acid gas.

Spring, an elastic body or device that recovers its original shape after being distorted. Springs are used to check recoil, diminish concussion or jar, or to store up energy. Two methods of manufacturing springs are ordinarily used; namely, the cold winding or forming process, and the hot forming process. Generally speaking, the hot winding process is employed in manufacturing springs using stock from ½ in. to 2 in. in diameter. The cold coiling process is used when forming springs smaller than ½ in. in diameter.

The cold forming process consists in continually feeding wire, while cold, into automatic machines of various kinds which automatically form the spring into the shape desired. Springs of large weight-carrying capacity, such as freight-car bolster and coupler springs, are generally manufactured by the hot winding process. This process differs from the cold winding method in that the material is first heated above its critical point and then coiled while in this condition. Subsequent heat treatments are then performed to impart the proper physical properties to the spring. The hot winding process is not continuous, but includes a number of individual operations, the bars first being heated in a furnace and then removed individually and placed on a lathe-like machine to take their shape. Both hot and cold springs are then finished to insure square, flat ends which eliminate the possibility of injury in handling.

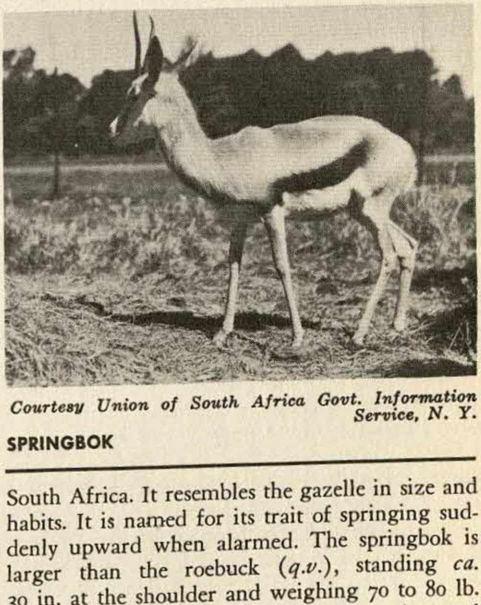
STATIC LOAD TESTING OF AN EXTENSION SPRING

Courtesy American Steel & Wire Co., N. Y.



Spring, the season of the year that follows winter and precedes summer, so called because it is the time when plants begin to grow in the temperate and colder zones. It begins with the vernal equinox, on Mar. 21, and ends with the summer solstice, on June 21. In North America the spring months are March, April, and May, while in the Southern Hemisphere they are September, October, and November.

Springbok (*sprĭng′bŏk*) or SPRINGBUCK, a species of antelope native to the plains of South Africa. It resembles the gazelle in size and habits. It is named for its trait of springing suddenly upward when alarmed. The springbok is larger than the roebuck (*q.v.*), standing *ca.* 30 in. at the shoulder and weighing 70 to 80 lb. It is reddish-brown in color, with white face and underparts. Its long, slender legs give it great speed. Great herds of springboks formerly gathered to feed on the plains, but in recent years they have become rare near settled areas because they have been so extensively hunted as a game animal and for hides.



Courtesy Union of South Africa Govt. Information Service, N. Y.

SPRINGBOK

Springfield (*sprĭng′fēld*), a city in central Illinois, capital of the state, seat of Sangoman County, 185 m. s.w. of Chicago. It is served by the Illinois Central, the Wabash (freight), the Gulf, Mobile and Ohio, and other railroads. The Capital Airport is located 4 m. n.w. of the city limits.

An industrial and commercial center, Spring-

Courtesy Springfield Assn. of Commerce and Industry
SPRINGFIELD, ILLINOIS
The state capitol

field is located in a farming and coal-mining region. The principal agricultural products are corn and other grains, livestock, and dairy products. Among the manufactures are electric meters, tractors, road machinery, auto-testing devices, garage equipment, shoes, flour and other grain products, and beverages. Springfield is the center of the Springfield, Ill., standard metropolitan statistical area (pop., 1960, 146,539), which includes Sangamon County; it had a value added by manufacture in 1958 of $99,623,000. The city's value added in 1958 was $88,395,000.

Springfield's greatest fame is as the home and burial place of Abraham Lincoln. Lincoln lived in Springfield from 1837, the year the city was selected (largely through his efforts) as state capital, until he went to Washington as President in 1861. After his assassination, his body was returned to Springfield, where the Lincoln Tomb and Monument, designed by Larkin G. Mead (*q.v.*), was erected in 1874 in Oak Ridge Cemetery. The Lincoln residence—the only home he ever owned—is maintained as a memorial by the state of Illinois. The Sangamon County Courthouse, built in 1837, was for nearly 40 years the state capitol. The Cathedral of the Immaculate Conception (Roman Catholic) and St. Paul's Cathedral (Protestant Episcopal) are located in the city.

The city's *ca.* 30 public elementary and secondary schools enroll *ca.* 14,500 pupils annually. Institutions of higher learning include Concordia Sem., Springfield Junior Coll., and the Lincoln Coll. of Law. Among cultural facilities are the Museum of Natural History, the Illinois State Library, and the Illinois Historical Library, which contains an extensive Lincoln collection.

Springfield was settled in 1818-19 by trappers and hunters from South Carolina, Virginia, and Kentucky. It was incorporated as a town in 1832 and chartered as a city in 1840. It has the commission form of government, with a mayor and four commissioners, all elected for four-year terms.

The population of Springfield in 1890 was 24,963. Its decade of greatest growth was 1900-10, when the population increased from 34,159 to 51,678. In 1950 it was 81,628; in 1960, 83,271.

Springfield, a city and port of entry in southwestern Massachusetts, seat of Hampden County, on the Connecticut River, 95 m. s.w. of Boston. The city has an area of 35.1 sq. m. It is served by the New York Central, Boston and Maine, and New York, New Haven and Hartford R.R.'s. Bradley Field is 12 m. s. of the city and Westover Air Force Base is 10 m. N.W. The Springfield Armory is located in the city.

An important industrial and trading center, Springfield has diversified manufactures, including automotive accessories, firearms, pharmaceuticals, chemicals, games and toys, hair preparations, and leather and paper products. Two major insurance firms have home offices, and the Merriam-Webster dictionaries are published, here. The city is the center of a standard metropolitan statistical area (pop., 1960, 478,592) including parts of Hampden, Hampshire, and Worcester counties, *e.g.*, the cities of Chicopee, Holyoke, Westfield, and Northampton. The city, in 1958, had value added by manufacture of $215,527,000.

The city's more than 40 public elementary and secondary schools enroll *ca.* 25,000 pupils annually. Its institutions of higher learning include American International Coll., Springfield Coll. (where basketball originated), and Western New England Coll. Among cultural facilities are the City Library, the Museum of Natural History and Seymour Planetarium, the George Walter Vincent Smith Museum, the Springfield Museum of Fine Arts, and the Connecticut Valley Historical Museum. Important religious structures include St. Michael's Cathedral (Roman Catholic) and Christ Church Cathedral (Protestant Episcopal). "The Puritans," a statue by Augustus Saint-Gaudens (*q.v.*), is in Merrick Park.

Springfield has a mayor and a bicameral government composed of a board of aldermen and a common council.

The city was named for the English birthplace of its founder, William Pynchon. In 1636 he led a small group of settlers from Roxbury to a site across the river from the present location, in what is now Agawam. Clashes with the Indians necessitated the move. The town was incorporated in 1641. Destroyed by fire (1645) in King Philip's War, it was quickly rebuilt. In

1786-87 Daniel Shays (*q.v.*) led a rebellion here to prevent judgment against debtors. A U.S. armory, established in 1794, attracted skilled labor and gave impetus to industrial development. The city was incorporated in 1852.

In 1900 Springfield had a population of 62,059. Its decade of greatest growth was between 1910 and 1920, which saw an increase from 88,926 to 129,614. In 1950 the population had risen to 162,399; in 1960, to 174,463.

Springfield, a city in southwestern Missouri, seat of Greene County, 25 m. s.w. of St. Louis. It is served by the Frisco Lines and the Missouri Pacific Lines. Covering a total area of 34.7 sq. m., Springfield is situated on a plateau of the Ozark Mts., *ca.* 1,300 ft. above sea level. It is a gateway to four recreational areas, Lake Taneycomo, Lake of the Ozarks, Table Rock, and Bull Shoals Lake, with streams famed for bass fishing. Springfield is the center of a fertile agricultural district producing a variety of fruits and vegetables. It is particularly noted for its dairying activities, and the city has the world's largest milk and cheese plants. Springfield's other industries include metal crafts, granaries, flour mills, and the manufacture of paper cups, portable typewriters, rubber products, furniture and pharmaceutical chemicals. The city is the center of the Springfield, Mo., standard metropolitan statistical area (pop., 1960, 126,276), which includes all of Greene County; it had a value added by manufacture in 1958 of $78,286,000. The city alone had a value added of $75,777,000.

Springfield's more than 30 schools enroll *ca.* 20,000 pupils annually. Among institutions of higher learning are Southwest Missouri State Coll., Drury Coll., Central Bible Inst., Baptist Bible Coll., and Evangel Coll. The city is the site of the Federal Medical Center, a prison hospital. Springfield operates under the city-manager form of government.

Founded in 1829, Springfield was laid out by John Polk Campbell and made the county seat in 1833. It was chartered as a city in 1847 and rechartered in 1855. The city was important strategically at the beginning of the Civil War. It changed hands several times before the spring of 1862, when it was captured by Union forces; thereafter it was held by the North until the end of the war. Springfield was the center of activity for the famous Union scout and spy, James Butler ("Wild Bill") Hickok (*q.v.*). One of the bloodiest battles of the war was fought at Wilson's Creek (*q.v.*), 10 m. s. of the city. Population, 1940, 61,238; in 1950, 66,731; in 1960, 95,865.

Springfield, a city in western Ohio, seat of Clark County, 22 m. N.E. of Dayton, on the Little Miami River. It is served by the New York Central, Pennsylvania (freight), and Detroit, Toledo and Ironton R.R.'s. Wright-Patterson Air Force Base is 15 m. to the southeast. The city has an area of 15.71 sq. m.

An industrial and commercial center, Springfield has manufactures of trucks, machine tools, electric motors and fans, diesel engines, turbines, caskets, incubators, pulp-mill and road-building machinery, thermometers, and many other products. The city is the center of the Springfield, Ohio, standard metropolitan statistical area (pop., 1960, 131,440), which includes all of Clark County; it had a value added by manufacture in 1958 of $127,716,000. The city alone had a value added by manufacture of $119,911,000.

The city's more than 30 public and parochial elementary and secondary schools enroll *ca.* 18,000 pupils annually. It is the site of Wittenberg Coll. Among points of interest are the Clark County Historical Museum, the Pennsylvania House, the Simon Kenton House, and the Madonna of the Trails. The George Rogers Clark and John Bryan state parks are nearby. Springfield has a city-manager and commission form of government, established in 1914.

Founded in 1801, Springfield became county seat in 1818 and was incorporated as a city in 1850. Population, 1940, 70,662; in 1950, 78,508; in 1960, 82,723.

Springfield Plan (*spring'fēld plăn*), a system of education for good citizenship initiated in the schools of Springfield, Mass., in 1939. Since Springfield is a city of diverse ethnic backgrounds, the plan was evolved as a means of fostering tolerance and eliminating bigotry.

Parents, teachers, and students work together to instill high standards of conduct by means of planned projects. From the kindergarten through the high school, the principles of a democratic society are continually experienced through group enterprises such as plays, publications, town meetings, etc. The dramatization of these concepts affects the daily experiences of the students. They in turn take into their homes an enlightened outlook which has resulted in a wide program of adult education for the parents. Thus, the school is the focus of the community for pragmatic education for democracy.

The keynote of the whole plan is participation. Most of the projects are initiated by the students and carried through by them under faculty supervision. Consequently, when they enter the adult world they will be prepared to cope with many situations, having met a set of similar circumstances at school. Students, discussing any issue, no matter how controversial, will have been educated to analyze issues in the proper way, when of voting age. The plan, though not completely accepted by other cities, nevertheless has influenced public-school systems throughout the country.

Spruance (*sproo͞'ans*), RAYMOND AMES, naval officer, born in Baltimore, Md., Jan. 3, 1886. A graduate of the U.S. Naval Acad., he served ashore in World War I at the U.S. Navy Yard, New York City. Appointed commander of the U.S.S. *Mississippi* in 1938, he was promoted to rear admiral in 1939 and headed the 10th Naval District in the Caribbean area. After the Japanese attack on Pearl Harbor (*q.v.*), Spruance headed a cruiser division in the Pacific. His success in the battle of Midway (1942) led to his appointment as vice admiral and as chief of staff to Adm. Chester W. Nimitz (*q.v.*), and in 1943 he supervised the U.S. invasion of the Gilbert Islands. In 1944 he was promoted to admiral after his command of invasions in the Marshall, Marianas, and Caroline islands. In 1945 he supervised the Okinawa invasion, becoming commander in chief of the entire Pacific Fleet. He commanded the U.S. Naval War Coll. in 1946-48, after which he retired. He served as U.S. ambassador to the Philippines in 1952-55.

Spruce (*sproo͞s*), the common name for a class of coniferous trees closely allied to the firs and pines. Many species have been enumerated, some of which attain to great heights and yield valuable timber. The *black*, or *double, spruce* is native to a region extending from Wisconsin to Maine and thrives as far north in Canada as 65° N. lat. In most cases the trunk is straight, often 70 ft. high, and it bears a conical head. The wood is very strong and is used in shipbuilding, being alike serviceable for hull, masts, and spars. The *white*, or *single, spruce* thrives farther north than the black and its leaves are somewhat longer. In this species the wood is tough and valuable for construction work. It grows in forests in Wisconsin and several species are native to the Rocky Mts. and California. In some regions the trees are from 80 to 115 ft. high. Another species, the *Douglas spruce*, or *fir*, is found in the western part of North America, extending far north into Canada. The *Norway spruce*, or *fir*, is a valuable tree of Northern Europe, especially in Norway, and from it the white or Christiania deal is obtained. Trees 150 ft. high are common in its native forests.

Sprue (*sproo͞*), a chronic disease of the intestinal tract due probably to nutritional deficiency, and possibly to a yeastlike fungus, *Monilia psilosis*, found in the stools of a majority of cases, although the exact significance of the presence of this fungus is not known. Sprue is characterized by remissions (periods of quiesence) and relapses. Symptoms and signs include dyspepsia, alternating constipation and diarrhea, flatulence, and bulky, pale, foamy, acid, and malodorous stools. The tongue and mouth become sensitive and sore, with development of inflammation of the tongue and mucous membranes and fever blisters about the lips; eventually the tongue becomes red, wasted, smooth, and shiny. The patient becomes pale, emaciated, weak, and quite anemic, with a greatly distended abdomen. This disease is endemic in the tropics (*tropical sprue*), but the sprue syndrome (symptom complex), called nontropical sprue, is seen also in the U.S. The lighter-skinned races seem to be more suspectible in the tropics, and women more so than men, usually in middle life. In the U.S., younger people and especially children are more frequently affected. Predisposing factors seem to be poor hygiene, dissipation, fatigue, and presence of other disease. Poor diet, low in meat, poor assimilation of food, especially fat, from the intestine, and deficient storage in the liver, plus the above-mentioned fungus infection, are all important etiological factors in this condition. Sprue is very chronic, and although good treatment often results in improvement, fatty stools may persist or recur for years. Death occasionally occurs from anemia, weakness, or intercurrent infection. Treatment includes intense therapy with liver extracts and iron, high protein and high vitamin diet, and large amounts of calcium and vitamin D, with restriction of fat intake. Ripe bananas are given as a large part of the diet because of their easy digestibility and high caloric content.

Spurge (*spûrj*), a genus of shrubs and trees native to temperate and tropical climates, including about 600 species. The representatives found in the temperate regions are mostly herbs, while those common to the warmer latitudes include many large trees. They have a milky and acrid juice and small flowers, and are leafless or the leaves fall off early. Some closely resemble certain cacti. A number are grown as ornamental plants and for their flowers. About 40 species are found in the eastern part of North America, but some of these have been introduced from Europe and Africa.

Spurgeon (*spûr'jŭn*), CAROLINE FRANCIS E., educator and writer, born in 1869; died Oct. 24, 1942, in Tucson, Ariz. She was educated at Cheltenham Coll., the Univ. of Paris, Oxford Univ. and in Dresden and London. She was lecturer in English (1901-06) and head of the English literature department (1913-29) at Bedford Coll., and lecturer (1906-13) and professor (1913-29) at the Univ. of London. She was the first woman ever to hold a full professorship in an English university. She taught at Columbia Univ. for a year in 1920 and while in the U.S. helped to organize the International Federation of University Women, of which she served as first president from 1920-24. She was an internationally known authority on Shakespeare and Chaucer. Her books include: "Mysticism in English Literature" (1913), "Five Hundred Years of Chaucer Criticism and Allusion" (1920-25), "Keats's Shakespeare" (1928), and "Shakespeare's Imagery and What It Tells Us" (1935).

Spurgeon, CHARLES HADDON, Baptist clergyman, born in Kelvedon, England, June 19, 1834; died in Menton, France, Jan. 31, 1892. He was the son of a Congregational minister and attended the schools at Colchester and Maidstone. In 1851 he was converted to the Baptist faith and accepted a charge at Waterbeach in Cambridgeshire. Transferred to a chapel in London in 1853, he attracted large audiences, and in 1861 his congregation relocated in the Metropolitan Tabernacle, where he often preached to 6,000 persons at a time. Spurgeon was a firm adherent to orthodox teachings, rejecting the validity of contemporary Biblical criticism and the tenet of baptismal regeneration. Over 2,000 of his sermons, collections of commentaries on the Bible, and works of interest to laymen and preachers, all popular and widely read, were published. He was also responsible for the founding of a college, an orphanage, and several chapels.

Sputnik (*spŭt′nĭk*), a name derived from the Russian (*s,* meaning "with," and *putnik,* meaning "traveler") and applied to the earth satellites launched by the U.S.S.R. See *Astronautics; Earth Satellite.*

Sputum (*spū′tŭm*), in medicine, matter expelled from the respiratory passages, very often the carrier of infectious germs, especially those resulting in tuberculosis (*q.v.*).

Spy (*spī*), the designation applied to a person employed to obtain information regarding the intent and resources of a foreign power, such information being serviceable to the military force or nation employing him. Spies have been employed for various purposes from remote antiquity, as is evidenced by the circumstance that Moses sent Joshua as a spy to obtain information to be utilized when invading Canaan. The office of a spy is not considered dishonorable in itself as long as it is exercised for patriotic reasons only. However, a professional spy is considered an informer. It is undoubtedly true that attractiveness is given by the risks accompanying engagements of this kind, especially to persons fond of adventure, but by the laws of war a spy, unlike ordinary prisoners of war, is subject to a penalty of immediate death. See also *Espionage.*

Courtesy Swiss Federal Railroad

JOHANNA SPYRI

Spyri (*shpē′rē*), JOHANNA, author, born near Zurich, Switzerland, on July 12, 1827; died July 7, 1901. Educated at the village school, she spent her entire life near Zurich. She was an outdoor girl, with a sentimental nature. She married at 25, but did not begin writing until the death of her husband in 1881. All of her works are stories of child life in Switzerland. Among these are "Cornelli," "Moni," "Vinzi," and "Heidi," the latter being the most distinguished of her works and now accepted as a children's classic.

Squab (*skwŏb*). See *Pigeon.*

Squadron (*skwŏd′rŭn*), a military term for a body of cavalry or group of airplanes which form the basic tactical unit. In cavalry, the squadron corresponds to the battalion in other ground arms, and is composed of a headquarters and two or more troops. In the air forces, two or more squadrons of a single class (bombardment, for example) form a group. The next higher air unit is the wing, consisting of two or more groups. A detachment of ships of war employed on a particular expedition is also usually called a squadron.

Square (*skwâr*), in geometry, a rectangle having four equal sides. Square measure relates to the areas of surfaces in square units, as square inches, square feet, square yards, square miles, etc. The rule for finding the area of a rectangular figure is to multiply the length by the breadth. The term square is used in arithmetic to represent a number that results from multiplying a number by itself; thus, 81 is the square of 9, for $9 \times 9 = 81$. The number thus multiplied is called the *square root,* and the method of finding it in algebraic and arithmetical formulas is known as the *extraction of the square root.* A tool used by carpenters is usually termed a *square,* consisting as a rule of two limbs inflexibly united at a right angle.

Squash (*skwŏsh*), the name of several species of plants belonging to the gourd family. They are grown extensively in gardens as a wholesome vegetable for making pies, preserves, and other commodities for table use. The plant is a trailing annual similar to the pumpkin and is planted and cultivated in the same way. Many species have been originated by propagation, but writers generally class them as belonging to four distinct species. Those cultivated include the winter squash, the crook-necked squash, the autumnal, the Yokohama, and the early summer squash. See *Gourd.*

Squash Rackets (*skwŏsh răk′ets*), a game similar to rackets (*q.v.*) but played with an inflated rubber ball (1 oz.) and a shorter-handled racket. It is generally played by two persons on a four-walled court (32 ft. long by 18½ ft. wide). The size and slowness of the squash-rackets ball makes this game different from squash tennis, which is played with a larger and livelier ball, resulting in faster action. In both games, the ball is hit against the court's front wall.

Squatter (*skwŏt′ẽr*), a U.S. term applied to one who takes up his residence on a tract of land without due authority, but whose occupancy of the same is not interfered with by the government or the rightful owner. The term *squatter rights* is applied to claims of ownership to land, after a considerable length of settlement by the squatter and evidence of improvement is shown. Such rights do not legally exist; however, ownership sometimes does take place in this way, particularly in frontier societies. During the controversy over slave *vs.* free states, the term *squatter sovereignty* came into use by the antislavery people as a contemptuous term for popular sovereignty. Popular sovereignty was a concept Stephen A. Douglas introduced in the Kansas-Nebraska Act (*qq.v.*), a plan for leaving it to the inhabitants of each territory to decide without the interference of Congress whether it should become a free or a slave state.

Squid (*skwĭd*), the name frequently applied to the cuttlefish and to many decapod cephalopods. This class of animals is found in nearly all the seas. The several species are more or less valuable commercially and as food for fishes and crustaceans. See *Cuttlefish; Octopus.*

Squier (*skwīr*), EPHRAIM GEORGE, journalist, archaeologist, diplomat, born in Bethlehem, N.Y., June 17, 1821; died in Brooklyn, N.Y., April 17, 1888. Squier, largely self-educated, was one of the outstanding archaeologists of the 19th century. He spent his early career teaching school and studying civil engineering, but he then turned to journalism. Throughout his career, he was associated with various newspapers and periodicals. His interest in archaeology began with a study of prehistoric remains in the Ohio and Mississippi valleys and in New York State (1843-48). In 1849 he was appointed U.S. chargé d'affaires to the republics of Central America, and from 1863 to 1865 he was commissioner to Peru. Later he served as Honduran consul general in New York City. While in Central America, he did considerable research and established himself as an authority on archaeological findings and general characteristics of the countries in which he served. His published findings include "Aboriginal Monuments of the State of New York" (1851), "The States of Central America" (1858), and "Incidents of Travel and Explorations in the Land of the Incas" (1877); some of his treatises were published under the imprint of the Smithsonian Institution.

Courtesy Brown Bros., N. Y.

EPHRAIM GEORGE SQUIER

Squill (*skwĭl*), a plant of the genus *Scilla,* belonging in the lily family. There are over 90 species, found chiefly in England and on the European continent. Many of the species are found in flower gardens and are used for landscaping purposes. The *sea onion, Urginea maritima,* found in the Mediterranean regions, is used for medicinal purposes.

Squinting (*skwĭnt′ĭng*), or STRABISMUS, or CROSSEYE, a deformity of the eye which makes it impossible to focus both eyes on the same object. The eye directed toward the object is called the fixing eye, and the eye which does not focus on the object is called the squinting eye. The cause may be spasm of the internal straight muscle, or it may be paralysis. Correction of the deformity is sometimes possible by glasses or exercises. In some cases, an operation which shortens or lengthens certain muscles corrects the problem.

Squirrel (*skwûr′ẹl*), a family, SCIURIDAE, of highly specialized rodents or gnawing mammals that vary from slender to robust and from tiny to medium in size. They are all vegetarian. Some are fossorial (*i.e.,* equipped to dig, thus live underground); others are terrestrial (*i.e.,* live on the ground); most are arboreal (*i.e.,* live in trees); and none are aquatic (*i.e.,* live in water). Some hibernate during the winter months. The squirrels are widely distributed over both hemispheres from sea level to above the timber line, but there are no squirrels native to Australia, New Zealand, or Madagascar. The family includes all the tree squirrels, flying squirrels, ground squirrels, spermophiles, rock squirrels, woodchucks, marmots, chipmunks, and the prairie dogs. Most squirrels have a tendency to store food in their dens. The front teeth, two above and two below, are chisellike and continue to grow throughout life. The cheek teeth, at least four on each side above and below, are rooted and cease to grow at maturity. See also *Chipmunk*.

The American *flying squirrel,* in the genus *Glaucomys,* cannot fly but volplanes, or glides, from a higher to a lower level from the top of one tree to the trunk of another some distance away. It has no motor power of its own for propulsion in the air. The flying membranes consist of loose folds of furry skin extending from each side of the body between the fore and hind limbs and attached to the wrists and ankles. The tail is broad and flat, and the fur is exceptionally fine, soft, and olive-brown. Like most nocturnal mammals, the flying squirrel has large dark eyes. Though rarely seen, owing to its nocturnal habits, the flying squirrel is not uncommon in the forested regions of North America from near the timber line in Canada southward into Mexico. American flying squirrels range in size from the northern species, which have a total length of 12 in., to the lesser forms in the southern U.S., which have an over-all length of 9 in. They almost invariably spend the day asleep in a hollow branch high up in a dead tree or in a woodpecker's discarded nest. Flying squirrels often breed twice a year and have from four to six young in a litter. They are sociable, feed on various kinds of seeds, nuts, berries, and insects, and hoard a winter supply of food like regular squirrels.

Courtesy American Wildlife Institute, Wash., D. C.
SQUIRREL

There are 13 genera of flying squirrels spread over the Northern Hemisphere. Most of them are found in Asia, but some also occur in Europe; there are no true flying squirrels in South America or Africa. The giant flying squirrel (genus *Petaurista*) is the largest of all arboreal squirrels and has an over-all length of 3 ft. It is found over most of southern Asia and adjacent islands and is common in India, Burma, and the Malay countries. The pigmy flying squirrel (genus *Petaurillus*) of Borneo is the smallest of the arboreal squirrels, with a head-and-body length of 3½ in. The European flying squirrel (*Pteromys*) is much like the American species. The woolly flying squirrel (genus *Eupetaurus*) is a big species and lives in the Himalaya at elevations up to 10,000 ft. The so-called scaly-tailed flying squirrel of western Africa (genus *Anomaluris*) is not even a squirrel, although it does look very much like a flying squirrel—including the gliding membranes—and has similar habits.

The *ground squirrel* proper is in the genus *Citellus.* The spermophiles and susliks are the typical ground squirrels, but there are other ground squirrels which are not known by that name, such as the woodchuck (*Marmota*), chipmunk (*Tamias*), prairie dog (*Cynomys*), and the African ground squirrel (*Xerus*). The ground squirrels are spread over North America, Eurasia, and Africa; but they do not occur in Australia, Madagascar, or South America. They live in burrows in the ground, some in community towns. Most of the ground squirrels are sociable and love company. Open prairie or arid semiwooded regions are ideal country for the ground squirrel. They feed on green vegetation, as well as seeds, berries, and some insects, and hibernate during the winter months, passing a period of from four to six months in a dormant state. Ground squirrels are about only during the daylight hours and breed once a year. The bobac or Tarbagan marmot is quite large and is common in eastern Asia. It is hunted for its flesh and fur, which are sold in the Chinese markets. In the Midwestern U.S., ground squirrels were troublesome to early farmers and ranchers because they honeycombed the ground with their burrows and destroyed the grain and vegetable crops.

The typical species of *tree squirrels* (genus

Sciuris) are restricted to the forests and woodlands of the Northern Hemisphere, but other tree squirrels are spread over Africa, southern Asia, and South America; none occur in Australia, Madagascar, or New Zealand. Tree squirrels vary in size from the pygmy squirrel (genus *Nannosciurus*), found on the islands of the South Pacific, which has a head-and-body length of 2¼ in., to the Oriental giant squirrel (genus *Ratufa*), which has a total length of up to 3 ft. Like other tree squirrels, it is active only during the day. It haunts the tall trees in the heavy jungle of southern Asia. In color, these squirrels vary from flaming red to gray, brown, or black. Some are gaily decorated with bright splashes of color or stripes. The tail is all-important to the squirrel; it is used to maintain balance in flying leaps among the treetops and to steer and guide the animal, when airborne, to a safe landing. Squirrels make their nests or "dreys" in the branches of trees, in hollow tree trunks, and occasionally in the rocks. They feed on many kinds of nuts, seeds, mushrooms, and buds of trees. The pelt of only one species is used by the fur trade, that of the Siberian pine squirrel (*Sciurus vulgaris*). It lives in the pine and evergreen forests of northern Siberia and has long, thick fur, dark-gray or almost black in color.

Squirrel Monkey (*skwûr'ẹl mŭng'kĭ*). See *Monkey*.

Srinagar (*srē-nŭg'ẽr*). See *Serinagar*.

Srirangam (*srē-rŭng'gạm*), a town in the state of Madras, India, on an island in the Cauvery River, 30 m. w. of Tanjore. The town is famous in the Hindu religion for a temple (built *ca.* 1600) dedicated to Vishnu, to which frequent pilgrimages are made. Population, *ca.* 25,000.

Stabat Mater Dolorosa (*stä'bät mä'tẽr dō-lō-rō'sạ*), a famous hymn of the Roman Catholic Church sung at liturgical services. The title means "Mother standing sorrowfully." The hymn has a plaintive melody created by the rhythm and rhyme of the Latin words; it evokes the emotions of Mary, Mother of Jesus, at the Cross. Authorship of the hymn has been attributed to several people, most frequently to Jacopone da Todi, a 13th-century Franciscan monk. Innocent III is the second person most often thought to be the author.

One of the most powerful and stirring hymns ever written, it has often been translated from its original Latin. It has also been used by Protestants and as concert music, and many composers, including Palestrina, Pergolesi, Verdi, Haydn, Rossini, and Dvořák, have set the hymn to music. Another Stabat Mater, the *Stabat Mater Speciosa,* refers to the Manger scene and was perhaps written by da Todi.

Stabilization (*stā-bị-lī-zā'shŭn*), the minimization of fluctuations in the exchange value of various monetary units of the world. Such fluctuations are a serious handicap to the smooth flow of international trade and payments. When they occur, established relationships in international prices and exchange transactions are upset, and the financial risks of those involved in trade are increased. The reasons for instability in the value of a particular monetary unit are closely related to the country's balance of payments, that is, its position as a debtor or a creditor nation. When a country cannot earn enough from its exports to pay for what it needs to import, the international value of its money is weakened.

Such a situation may arise, as it did in Europe after the two World Wars, because a country's productive capacity is temporarily crippled. In Great Britain particularly, after World War II, the difficulty was aggravated because liquidation of many international investments had deprived it of an important supplementary income in addition to what was earned from exports.

The more general causes of upsets in a country's balance of payments are booms and declines in business activity and national economic policies which permit an excessive use of credit. When these trends raise production costs and levels of consumption within an economy, the country's nominal volume of exports is increased in relation to imports because of price rises on goods for export, often endangering the country's ability to compete in foreign markets.

In the case of primitive, or underdeveloped, economies producing only one or two raw materials for export, balance-of-payments problems arise particularly when the demand for—or the price of—the commodity it exports falls on the world market.

Efforts have been made by national governments and international organizations to ease the impact of such economic trends on exchange values. Both the British and U.S. governments, for example, have set up organizations to provide loans or insurance, or both, for export-import transactions.

On the international level, recent efforts to stabilize exchange values have been centered in the operations of the International Monetary Fund and the International Bank for Reconstruction and Development (*qq.v.*), organizations set up after World War II and financed by subscriptions from member nations. The fund's chief function is to provide international credit to a country in balance-of-payments difficulties by buying up its currency (and paying, of course, in foreign currencies). The bank makes loans to nations and private investors for the reconstruction and development of industry. It has been of particular value in building up industrial resources in underdeveloped areas.

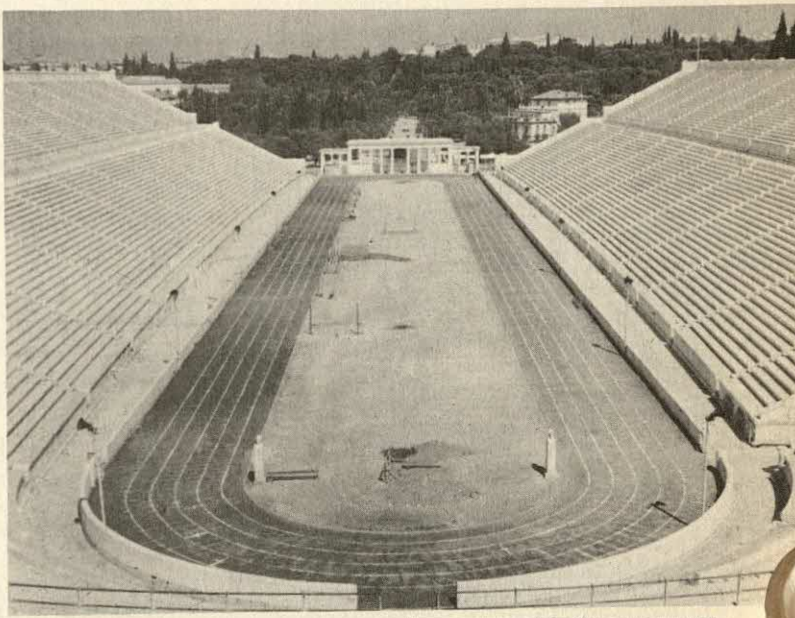
Another circumstance which has been a convenience, if not an actual force, in stabilizing exchange values is the widespread acceptance of gold as a constant standard by which the value of various monetary units may be defined. Gold as an international money standard is not treated as a commodity, and its value does not fluctuate.

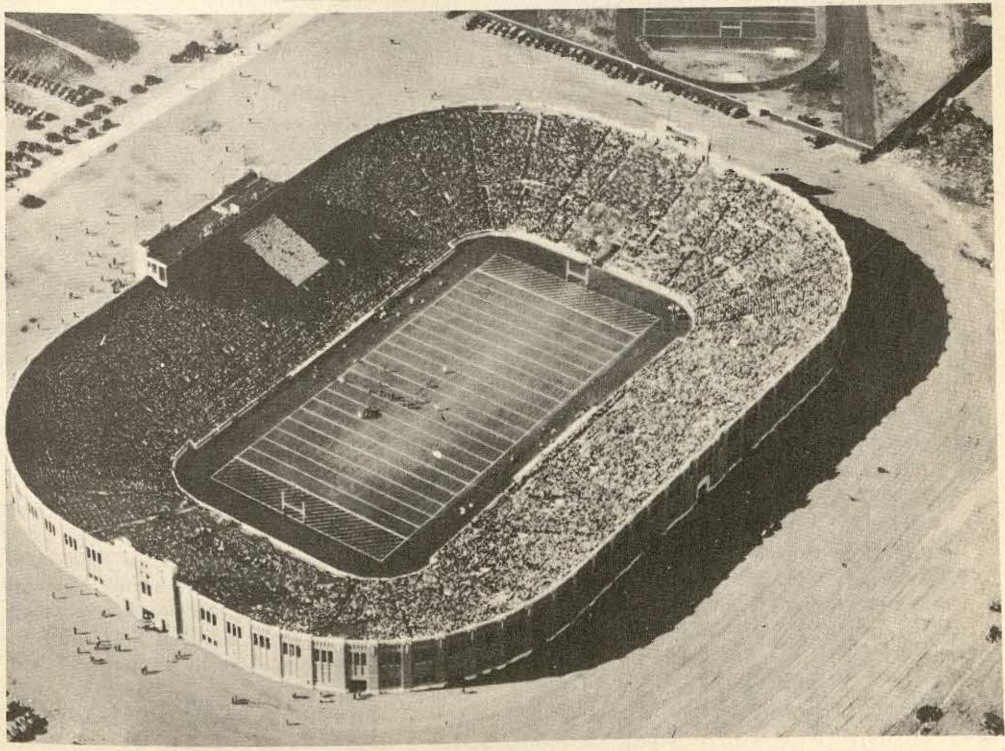
Stabilizer (*stā′bĭ-līz-ẽr*). See *Aviation*.

Stadium (*stā′dĭ-ŭm*), the name of a Greek course for foot races at the places where games

ANCIENT AND MODERN

The Olympic Stadium (*right*) at Athens, Greece, was rebuilt *ca.* A.D. 140. It was restored in 1896 for the resumption of the games after a lapse of 1,500 years (*courtesy Ewing Galloway*). Among notable modern stadiums is that of the Univ. of Notre Dame (*below*), at South Bend, Ind. (*courtesy Assn. of Commerce, South Bend, Ind.*)





were celebrated, and sometimes in the gymnasia where there were no games. The stadium was an oblong area terminating at one end by a straight line and at the other by a semicircle, and ranges of seats rising above one another in steps were provided at the latter. The celebrated stadium at Olympia was 600 Greek ft. long, equal to 606 ft. 9 in. by English measurement. Other stadia were at Athens, Delphi, Epidaurus, and Thebes.

Among the noted modern stadia are those at Philadelphia, Pa.; Stanford Univ., California; Soldiers Field, Chicago; Notre Dame Univ., South Bend, Ind.; and California Stadium, Berkeley, Cal.

Stadtholder (*stăt'hōld-ẽr*), the title given by the provinces of The Netherlands to the chief executive. When Holland and Zealand revolted against Spain, in 1580, William of Orange was made the chief magistrate, or stadtholder. His son, Maurice of Nassau, was declared stadtholder in 1584, at the time the former was assassinated. The dignity continued in the house of Orange, with occasional intermissions, until 1747, when William IV was declared hereditary stadtholder. In 1814, after the restoration of the Orange family, the title was exchanged for that of king.

Staël-Holstein (*stä'ĕl-hōl'stīn*), ANNE LOUISE GERMAINE NECKER, BARONNE DE (known as *Madame de Staël*), writer, born in Paris, France, Apr. 22, 1766; died July 14, 1817. She was the daughter of Jacques Necker, Swiss minister of finance to Louis XVI. A precociously intelligent child, she developed conversational powers, as well as a store of knowledge. In 1786 she was married to Eric Magnus, Baron of Staël-Holstein, later Swedish ambassador to Paris. In August 1792, prior to the September massacres, she fled to Coppet, her father's estate on Lake Geneva, gathering around her a group of émigré statesmen and writers. In 1795, after her return to Paris, she published "Reflections on Peace," advocating tolerance and a moderate republic or a constitutional monarchy. Her first important work, "On the Influence of Passions on Happiness of Individuals and Nations," appeared in 1796.

By 1802, she had reached the height of her social and political power. Disappointed in the political aspirations of Napoleon, she took a dislike to him. In an attempt to quiet her criticisms and tactless opposition, Napoleon forbade her to live within 40 leagues of Paris and finally banished her. For some 10 years, she wandered back and forth between France and Geneva, occasionally visiting other places on the Continent. She visited Goethe, Schiller, Wieland, and Byron. She returned to Paris after the Restoration, and her death occurred two years later.

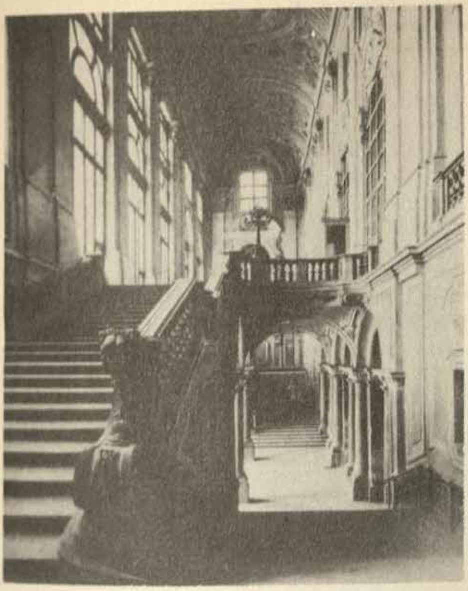
Her years of exile were her most fertile literary period. "On Germany" (1813), a critical work on Germany, introduced Germany to France. Her other works include:, "Letters on the Writings and the Character of Jean-Jacques Rousseau" (1788), "The Influence of Literature on Society" (1800), two novels, and "Considerations Concerning the Principal Events of the French Revolution" (1818).

The greater part of Mme. de Staël's work was written in a conversational style and reflected the dominant influences and ideas of her age. Therein lies her claim to an important position in French literature. Her thought was not original, but she crystallized most of the important tendencies of the late Monarchy, the Revolution, the Empire, and the Restoration. Her work exerted a far-reaching influence on modern criticism and the cosmopolitan spirit.

Staff (*stăf*), in a military organization, of a battalion or larger unit, is a group of officers assigned or attached to a commander for the purpose of aiding him in exercising his responsibilities. Staff officers have no duties other than their staff duties, and ordinarily do not serve as commanders of service or combat troops unless specifically designated as such. Staffs of divisions and larger units are subdivided into two groups, termed the general and special staffs. In addition, general officers are normally allowed one or more aides, who are termed a personal staff.

Stag (*stăg*), or RED DEER, a species of large deer native to the northern sections of Europe and Asia. The male, or *hart*, has round, branching horns. They are shed annually and reach their largest size in the seventh year. The female, or *hind*, is hornless and smaller than the male. These animals have a grayish-brown color in the winter and a reddish-brown in the summer, and are classed among the handsomest of the deer family. They have an acute sense of smell and are strong, swift, and watchful. The pairing season occurs regularly in August and the young, or *calf*, is born in May. Formerly these animals were seen in large numbers in Western Europe and they are still found in protected regions, especially in Germany, Austria, and Russia. A class of deer known as the *wapiti* is nearly allied to the red deer of Europe, but is native to North America Similar species occur in Northern Africa. See *Deer*.

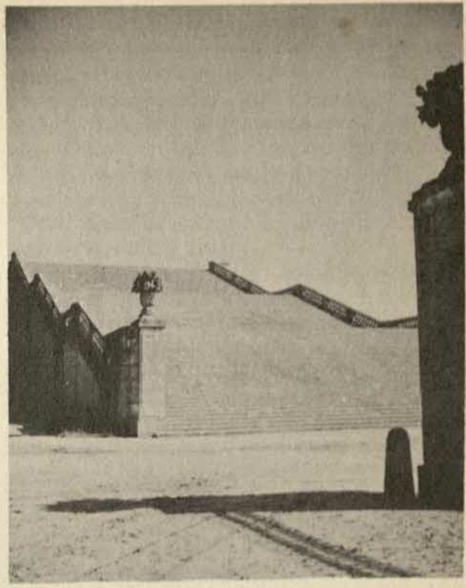
Stag Beetle (*stăg bēt''l*), the common name applied to a large group of insects, including about 550 species. Many of these beetles are of considerable size and receive their name from the large and powerful mandibles of the males. The *common stag beetle* of Europe is about 2 in. long, exclusive of the mandibles, and has a black or dark brown color. During the day it lives in the trunks of trees, but flies about freely at night, often entering houses and other places where lights are burning. A species called the *horned*



Courtesy Brown Bros., N. Y.

ITALIAN BAROQUE STAIRCASE

In the *Palazzo Madama,* Turin, designed by Filippo Juvara (1685-1735)



Courtesy French Press & Information Service, N.

FRENCH BAROQUE STAIRCASE

In the Park of Versailles, designed by Jules Mansart (1646-1708)

bug is common to the eastern part of North America, particularly New Brunswick and New England, and has a mahogany-brown color. It has spread westward and is frequently seen in the evening, especially in the branches of apple, willow, and oak trees.

Stage (*stāj*). See *Drama; Theater.*

Staghound (*stăg′hound*), a breed of hounds formerly used in Europe for hunting stags, wolves, and other large animals. The staghound is somewhat similar to the foxhound, but is larger, with rough fur and drooping ears; it is noted for its strength and swiftness. The breed is now almost extinct.

Stained Glass (*stănd glăs*). See *Glass.*

Stainer (*stā′nĕr*), SIR JOHN, organist and composer, born in London, England, June 6, 1840; died in Verona, Italy, March 31, 1901. After serving as organist and choirmaster at various London churches, he entered Christ Church Coll. in Oxford Univ. (1859), and was organist of the university (1863-72). From 1873 to 1888 he was organist of Saint Paul's, London, resigning because of failing eyesight, and from 1889 to 1899 served as professor of music at Oxford. He wrote much church music, including the cantatas "The Daughter of Jairus" (1878) and "The Crucifixion" (1887). With W. A. Barrett he also wrote "A Dictionary of Musical Terms" (1876). He was knighted in 1888.

Staircase (*stâr′kās*), architectural term for the structure which encloses the stairs within a building. The term refers to the architectural shape of the stairs proper as well as of the enclosing walls. The form of a staircase follows the style of its period. Ancient civilizations—Egyptian, Babylonian, Greek, Roman—lacked elaborate staircases, but simply used steps without specific artistic forms. In open air they were made of stone, straight and without any decorative additions. Connecting inside stairs probably were made mostly of wood—there are none preserved—and served mainly functional purposes, without ornamentation. Only in ancient Crete (around 1600 B.C.) did stairs connecting the various terraces of the Palace of Cnossos become an essential part of the general architecture. In the Middle Ages, the role of the staircase was limited; simple wooden steps connected house levels or led in spiral form to the top of fortress towers, or to church steeples.

The first architecturally interesting staircases occur at the end of the 15th century in Italian Renaissance palaces, in Florence and later in Rome. In the 16th century, the greatest development took place in the castles along the Loire River in France (Chambord, Blois, etc.). In Italy the great architects of the late Renaissance, especially in Genoa, Venice, and some palaces in Rome, excelled in expansive staircases, as did also, in different forms, architects in Spain and England. But in the Baroque period (17th and 18th centuries) the architectural development of the staircase took place. In Italy (Vatican, Rome), in

France (Tuileries, Paris), and in England in many mansions, the staircase became at the same time complex and sumptuous. Whether within a rectangular, round, or oval case, the staircase developed into complex space patterns. It was always interrupted by landings, sometimes divided in two parts, to be joined again on a higher landing. This overlapping of one flight through another was the aim of the architects, in order to create a kind of perspective which competed with the imaginative power of stage designs. The most famous architectural writers of the 17th and 18th centuries devoted entire chapters to staircase design.

The whole development was crowned by the famous staircase of Versailles, built under Louis XIV. The external stairs (the so-called "Hundred Steps"), connecting the garden with the terraces, correspond in elegance and grandeur to the beautiful inner staircases of the castle. All over Europe, through the whole 18th century, these staircases were imitated. Even the most famous staircase of the 19th century, also often imitated—that of the Grand Opera in Paris, by the architect Garnier—was an outgrowth of the period of Louis XIV. In modern times, the staircase has lost its great architectural meaning through the invention of the elevator; only where mere representation is aimed at, as in the halls of museums, libraries, and other public buildings, or in the lobbies of great hotels, one or two flights are developed.

In the U.S., it is mainly the staircases of private houses of the 18th century and early 19th century which are architecturally notable.

Stalactites (*stȧ-lăk̦′tīts*), in geology, mineral formations, resembling icicles, which hang from the roofs of caverns. They are caused by the evaporation of water containing considerable quantities of calcium carbonate. The mineral is deposited in icicle shape as the water drips from the cavern roof. Similar formations, called stalagmites, are built up from the cavern floor.

Stalin (*stȧ′lyĭn*), JOSEPH VISSARIONOVICH (DZHUGASHVILI), dictator of the Soviet Union, born in Gori, Georgia, Dec. 21, 1879; died in Moscow, March 5, 1953. The "man of steel," which is what Stalin means in Russian, was the son of an impoverished and drunken village cobbler, his mother, the daughter of a serf. He went to a church school and later to the Tiflis Theological Seminary, but was expelled for revolutionary activities in 1898. During the next 17 years he was an underground Communist, devoting himself to proselytizing for Marxism and agitation against the Czarist regime. Between 1902 and 1913 he was arrested six times and sent to Siberia several times; five times he escaped. The last time he was imprisoned in a remote part of Siberia and remained there until 1917, when the Russian Revolution opened his prison doors.

In pre-revolutionary years Stalin had met Lenin and Trotsky (*qq.v.*), the top men in the Communist movement, and aligned himself with Lenin's Bolshevik or extremist faction against the Menshevik or evolutionist faction that was supported by Trotsky. This party split was the germ of the historic conflict between Stalin and Trotsky, although Stalin's hatred of Trotsky was part of his enmity against the intellectual leaders of the Revolution. Stalin held the modest post of Commissar of Nationalities in the first Lenin government, but was named, in 1917, to the Politburo (Political Bureau of the Communist party's Central Committee) which was to give "political guidance to the party." Five years later he was named to the new post of secretary of the Politburo's Central Committee. Through political manipulation he used this position to rule the Soviet Union for years without holding state office. Stalin served with Zinoviev and Kamenev in the triumvirate that held power during Lenin's final months. After Lenin's death in 1924, the party factions split. Zinoviev and Kamenev joined Trotsky's left wing urging world revolution. The right wing, led by Rykov and Bukharin, favored modified Communism and a truce with the capitalistic West. Stalin played the Right against the Left and vice versa and eventually eradicated both. By the early 1930's Trotsky, Stalin's chief rival, was exiled and Lenin's old guard exterminated, while Stalin stood supreme.

With implacable ruthlessness Stalin set out to remake the face of the country. In 1928 he launched the first of a series of Five-Year Plans (*q.v.*), forcing industrialization of the country that was about 50 years behind Western standards. He also persisted in the collectivization of Russia's agriculture, in the course of which the "kulaks," or the comparatively well-off peasants, were dispossessed; several million persons died in the 1932-33 famine engineered by Stalin to speed collectivized farming. Industry mushroomed, however, with new factories, oil wells, mines, even new cities, in the Urals, Soviet Central Asia, and the Far East. In the process, thousands upon thousands of political "unreliables" and Trotskyites were sent to slave labor camps, the Red Army was purged, and, when in 1940 Trotsky was assassinated in Mexico, even the shadow of a challenge to Stalin disappeared.

In 1939 Stalin signed a nonaggression pact with Hitler that the world took as a "go-ahead" sign for the Nazi dictator to war on the West. From the pact Stalin gained territory—the Baltic republics and parts of Poland—and time to strengthen Russia's defenses against the inevitable German onslaught. In May 1941, a month before Hitler invaded Russia, Stalin assumed the office of premier, his first and only official government post. During the war, Stalin is credited with

Courtesy Consulate General of U.S.S.R., N. Y.

JOSEPH V. STALIN

imposing a devastating scorched earth policy and planning the defeat of the German army at Stalingrad (*q.v.*). In 1943 he became a Soviet marshal and took command of the Russian armies. Stalin met (1943) with President Roosevelt and Prime Minister Churchill at Teheran, Iran—his first trip outside his country's borders—and, in 1945, he joined them at the Crimea Conference (*q.v.*). At Potsdam, Germany, he met with Churchill and Attlee and President Truman (July 1945) to chart the war against Japan and the postwar era in Europe. But the agreements with the Western allies for the postwar world were breached by Stalin, who pushed Soviet imperialism through Communist fifth columns backed by the Red Army, through national Communist parties, and through appeals to nationalism. He sought to block the West's European Recovery Program (*q.v.*) and reached out, through Greek Communists, for Greece, but the U.S., through the Truman Doctrine, blocked him. Stalin also received a blow when Marshal Tito (*q.v.*) rebelled against Kremlin dictation and took Yugoslavia out of the orbit of Soviet satellites (see also *Communism*).

Counting absorbed territory and satellite states, Stalin was suzerain in an area embracing a third of the world's population and a fourth of its area. During his lifetime he received the adulation of a deity. With the rise to power of Nikita S. Khrushchev (*q.v.*), however, denigration of Stalin became a point of Communist party policy, beginning with a sensational speech by Khrushchev at the 20th party congress (1956), in which he detailed the "evil deeds" of Stalin and exhorted the party leaders to beware of the "cult of personality." The 1958 edition of the "Great Soviet Encyclopedia" devoted only five pages to Stalin, in contrast to the 87 pages of previous editions. In 1961 Khrushchev expanded on his denunciations of Stalin and enlisted the Russian people in the campaign to turn a hero into a villain. The 22nd party congress authorized the removal of Stalin's body from its place of honor beside that of Lenin in the mausoleum in Red Square; statues and pictures of him were destroyed, and his name was removed from the various cities named in his honor—Stalingrad becoming Volgograd and Stalinsk reverting to Novokuznetsk and Stalino to Donetsk. Many of the top figures in the Russian party were denounced as Stalinists and plotters against Khrushchev and were politically purged, although there were no trials or executions.

Little is known about Stalin's personal life. He was married twice and by his second wife had a son, Vassily, reportedly a general in the Soviet air force.

Stalingrad (*stä′lĭn-grăd*), BATTLE OF, a crucial battle of World War II (*q.v.*), which took place in the city then named Stalingrad but renamed Volgograd (*q.v.*) in 1961 during the campaign of de-Stalinization that followed the death of the wartime Soviet leader (see *Stalin, Joseph V.*). The battle of Stalingrad began in September 1942 with an attack by a German army of 22 divisions under Gen. Friedrich von Paulus (1890-1957). After 66 days of savage fighting, the Germans held most of the city but had failed to dislodge the Soviet forces on the west bank of the Volga River. A Russian counteroffensive, under Gen. Georgi Zhukov (*q.v.*), enveloped the Axis forces in a pincers movement, defeated a German relief column, and thwarted the efforts of von Paulus to break out. On Feb. 2, 1943, von Paulus surrendered with the remnants of his forces. German losses in killed and captured totaled *ca.* 330,000 men.

Stallings (*stôl′ĭngz*), LAURENCE, author and playwright, born in Macon, Ga., Nov. 25, 1894. He was graduated (1915) from Wake Forest Coll. and served as a captain in the Marine Corps in World War I, during which he lost a leg. After receiving an M.S. degree from Georgetown Univ. (1922), he worked on various newspapers, becoming assistant drama critic and later literary editor of the New York *World*. In collaboration with Maxwell Anderson (*q.v.*), he wrote the sensationally successful play "What Price Glory" (1924), as well as "First Flight" and "The Buccaneer" (1925). Stallings published the autobiographical novel "Plumes" in 1924. He was book reviewer for the New York *Sun* (1930-32) and edited "The First World War: A Photographic History" (1933). As a writer for motion pictures he produced such film plays as "The Jungle Book"

(1942), "Christmas Eve" (1946), and "Small Town Story" (1946). Returning to the World War I theme, he also published "The Doughboys: The Story of the A.E.F." (1963).

Stamen (*stā'mẹn*), that part of flowers which contains the pollen, or male fertilizing element. It consists of a filament, an anther, and the pollen. The *filament* is the tender stalk, or support, and attached to it is the *anther*, which forms a double-celled sac containing the *pollen*. When the anther and pollen are wanting, the stamen is said to be sterile and abortive. The *pistil* is the female part and normally occupies the center of the flower. It is composed of the ovary, with its ovules and stigma. Fertilization takes place when the pollen comes in contact with the pistil. These two essential parts are often in different flowers and sometimes on distinct plants.

Stamford (*stăm'fẽrd*), a city in southwestern Connecticut, in Fairfield County, on Long Island Sound, 32 m. N.E. of New York City. It is served by the New York, New Haven and Hartford R.R. Stamford, with an area of 38.4 sq. m., is both a large manufacturing center and a residential suburb of New York City. Among its diversified products are chemicals, electronic components, electric motors, brass, copper, roller bearings, machine tools, and drugs. It is the center of a standard metropolitan statistical area (120 sq. m.; pop., 1960, 178,409) which comprises, besides Stamford, three towns in Fairfield County. In 1958 the area had a value added by manufacture of $175,813,000; the city's value added was $120,227,000. Stamford's public and parochial schools enroll *ca.* 20,000 students annually. The city is the site of St. Basil's Coll. and of a branch of the Univ. of Connecticut. Among the noteworthy structures of the city are the Ukrainian Catholic St. Vladimir Procathedral, the Webb and Barnum houses, built in the 18th century, and the Washington building, on the site of Webb's Tavern, where George Washington breakfasted in 1789. Stamford was founded in 1641 and incorporated as a city in 1894. Population, 1950, 74,293; in 1960, 92,713.

Stammering and Stuttering (*stăm'ẽr-ĭng, stŭt'ẽr-ĭng*). See *Voice.*

Stamp (*stămp*), a small piece of paper issued by the government and sold to the public to be attached to letters, documents, and packages liable to the payment of duty. Stamps for the payment of postage on letters and small parcels came into use in England in 1840, where their adoption was suggested by Sir Rowland Hill, and they were generally adopted in the U.S. in 1847. Each nation now has a system of stamps for its mail service, on which the portrait of some distinguished public figure, an ensign, landscape, or scene commemorating a certain event, is printed, together with the denomination of the stamp. The different stamps used in a nation at the same time vary in number from 75 to 200, to supply various denominations and stamps for different purposes. The first stamp issued in the U.S. was of the denomination of five cents and bore the portrait of Benjamin Franklin.

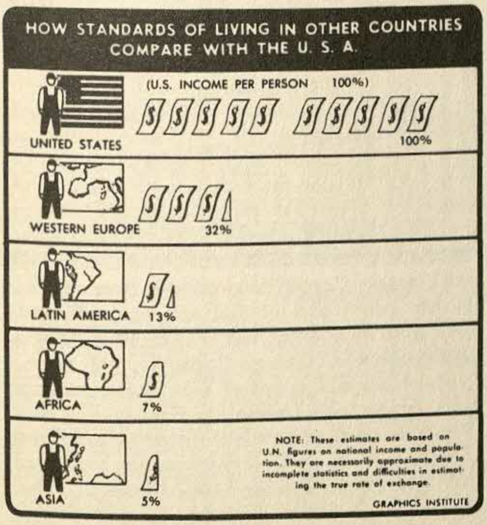
Revenue stamps are those issued by the government to be attached to documents liable to duty. *Thrift* or *savings stamps,* issued by some governments in various, primarily small, denominations, induce many people to save by investing in these government securities. Excise taxes, such as those on cigars and alcoholic beverages, also are covered by stamps.

Stamp Act (*stămp ăḳt*), a revenue law passed by the British Parliament in 1765. It required that all paper, vellum, and parchment used in the American colonies should be stamped, and declared null and void all legal documents written on unstamped paper. The measure was proposed by George Granville, Chancellor of the English Exchequer, as a means to raise revenue. This aroused such violent opposition in America that all the colonies except Virginia, New Hampshire, Georgia, and North Carolina sent delegates to a congress at New York, which remained in session from Oct. 7 to Oct. 25, 1765. This congress addressed a protest to the king and declared that the colonies could be taxed only by their own representatives in the colonial assemblies. The English looked on the declaration as that of an unconstitutional gathering, but continued opposition finally caused the repeal of the Stamp Act in 1766. This legislation for raising revenue was one of the causes that led to the Revolution.

Standard Fineness of Coinage (*stănd'ẽrd fĭn'nĕs of ḳoin'ĭj*), the ratio of pure gold or silver to the total weight required by law for the manufacture or minting of coins. In the U.S., the standard fineness for gold and silver was established under the Coinage Act of 1837 as nine-tenths, or 0.900, the gold dollar containing 23.22 grains of pure gold, and the silver dollar, 371.25 grains of pure silver. Under previous acts, adopted between 1792 and 1837, the ratio between gold and silver coins was frequently changed. Under the Gold Reserve Act of 1934, the gold dollar was reduced to 13.70 grains of pure gold, although the standard fineness remained the same 0.900. This was achieved by reducing the total weight of the gold dollar from 25.8 to 15 5/21 grains of standard gold. See *Standard Weight of Coinage.*

Standard Metropolitan Statistical Area (*mĕt-rō-pŏl'ĭ-tạn stạ-tĭs'tĭ-ḳạl âr'ē-ạ*), abbreviated S.M.S.A., a designation adopted by the U.S. Bureau of the Budget in 1959 for purposes of economic analysis. It is a county or group of contiguous counties (except in New England; see *below*) containing at least one city of 50,000 inhabitants or more; or "twin cities" with a combined population of at least 50,000, the smaller of which must have a population of at least 15,000. Contiguous counties each having a city of 50,000 or more inhabitants are included in an S.M.S.A. if they are essentially metropolitan in character, are socially and economically integrated with the central city, and the central cities are within 20 m. of each other. In New England, the city and town are administratively more important than the county and are the units used in defining S.M.S.A.'s. Because more restricted areas thus result, a population density of at least 100 persons per sq. m. is used as the measure of metropolitan character. As a result of the 1960 census (*q.v.*), 212 S.M.S.A.'s had been established in the U.S.

Standard of Living (*stăn'dẽrd of lĭv'ĭng*), a term used in economics to signify the quantity of consumption goods and services which a worker can obtain for his wages. Thus the standard of living of a worker is a function of his income. The term is frequently applied today in describing the economic status of groups or countries. When used in this sense the average income of the workers is calculated; when the standards of living of different countries are compared corrections for differences in the respective price levels must first be made. The standard of living of a worker in the U.S. is about twice that of a worker in Western Europe, three times that of a Latin-American worker, and about seven times that of the average worker in Asia. The standard of living of the American family, in terms of weekly wages, is almost ten times higher than that of the average Russian family.


HOW STANDARDS OF LIVING IN OTHER COUNTRIES COMPARE WITH THE U. S. A.

NOTE: These estimates are based on U.N. figures on national income and population. They are necessarily approximate due to incomplete statistics and difficulties in estimating the true rate of exchange.

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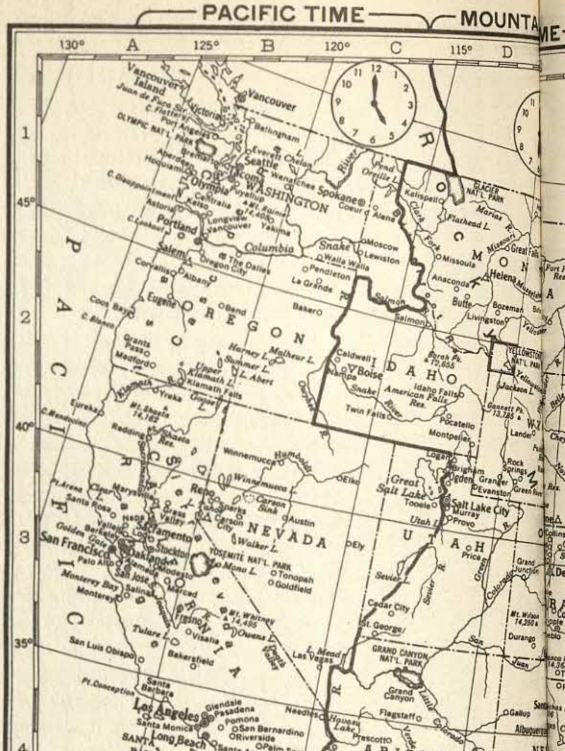
Standard Oil Company (*stăn'dẽrd oil kŭm'pȧ-nў*), a business organized in 1870, in Ohio, by John D. Rockefeller and others, which rapidly achieved a dominant position in the petroleum industry. The 23-year-old Rockefeller and his partner early invested a small amount—derived from the profits earned by their farm produce business—in a Cleveland oil refinery built by Samuel Andrews. In 1865 Rockefeller sold out his produce business, bought out the refinery interest held by his partner, Maurice B. Clark, and the oil firm of Rockefeller & Andrews was formed. Under Rockefeller's extraordinary skill in organizing and financing, the young company's refinery had by 1870 become the largest in Ohio, which was then the center of the U.S. petroleum refining industry. The birth of the Standard Oil Co. in that year, with a capital of $1,000,000, came at the beginning of a period marked by major economic developments throughout America. Large corporations were being formed, mass-production methods were being introduced, legal controls over manipulating stocks, marketing, and transportation were far in the future, and "mergers" were the order of the day. It was this which made possible the phenomenal growth of Standard Oil from a control of some 10 per cent of the industry in 1870 to nearly 90 per cent in 1880. This resulted partly from high efficiency, and partly from manipulation of transportation rates to the detriment of smaller competitors, thus laying the foundation for later legislation to restrict such practices.

By 1882 the Rockefeller interests included 40 companies engaged in crude-oil production, and the various phases of petroleum transportation, refining, and marketing. To integrate this ever-expanding enterprise, the gigantic Standard Oil Trust was formed. The original plan to organize a subsidiary in each of the 48 states was never entirely carried out, but it did result in the formation of several state companies, notable among them the Standard Oil Co. of New Jersey (changed in 1892 to its present name). Spurred by multiplication of trusts in various industries, Congress passed the Sherman Antitrust Act in 1890, and two years later the Standard Oil Trust was "re-organized," to emerge finally (1899) in the form of a holding company under the aegis of the Standard Oil Co. (New Jersey) with a capital of $110,000,000. In the years that followed, new petroleum fields were developed and Standard Oil set up subsidiary companies in all parts of the world. At the same time the entire industry was expanding from its early production—limited largely to kerosene, lubricating oils, axle grease, and harness oil—to include many products in the drug, cosmetic, and synthetics industries, while the development of automobiles was making motor gasoline the dominant factor in the petroleum field.

In 1911 the U.S. Supreme Court upheld lower court verdicts that Standard Oil Co. (New Jersey) was operating in restraint of trade, thereby violating the Sherman Antitrust Act. Under terms of the ensuing order to disband, 34 separate and independent groups were formed, 19 of them still operating today on an independent, competitive, and successful basis. Because the name Standard Oil was well known to the public, and therefore a valuable business asset, six of the new companies retained it: Standard Oil Co. (New Jersey), largest descendant of the Standard Trust; Socony-Vacuum Oil Co., a merger of Standard Oil Co. of New York and Vacuum Oil Co.; Standard Oil Co. (Indiana); Standard Oil Co. of California; Standard Oil Co. (Ohio); and Standard Oil Co. (Kentucky). It is estimated that the companies which emerged from the dissolution of the old Standard Trust now do about 34 per cent of the oil business in the U.S.—a testimonial to the value of competition in view of the vast expansion which has taken place in the industry during the automotive mass-production period of their operation as independent concerns.

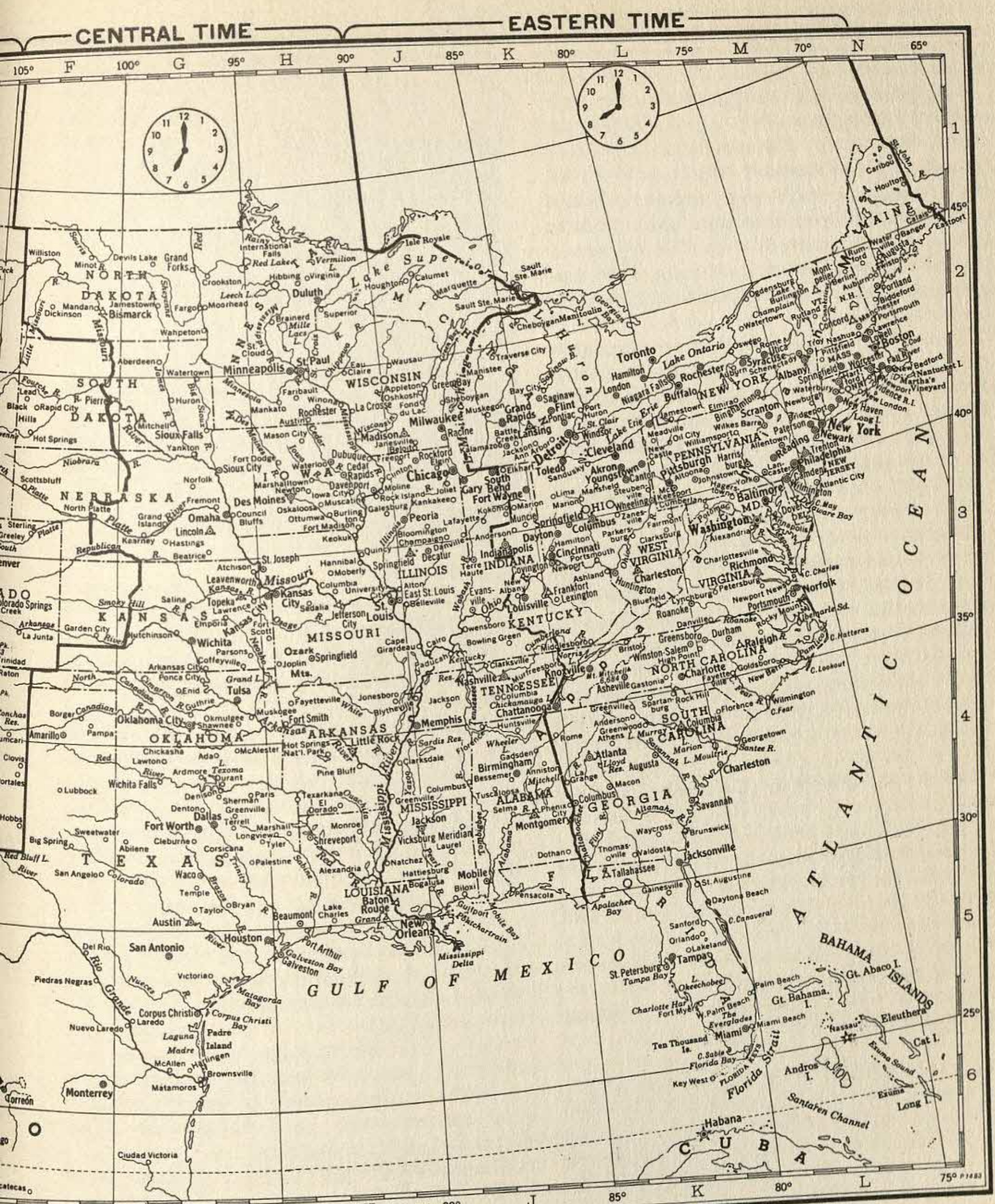
Standard Time (*stăn′dẽrd tīm*), a general system of reckoning time, with the Greenwich meridian as a basis, and adopted by all principal railroad companies in Canada and the U.S. It went into general effect at 12 o'clock, noon, Nov. 18, 1883. The system originated with Professor Abbe, of the Signal Bureau at Washington, D.C. It divides the continent into four longitudinal zones and fixes the time for each zone. Zones are approximately 15° of longitude wide, thus corresponding to one hour of time. The time of the four zones is known as Eastern, Central, Mountain, and Pacific.

Eastern time is used in the U.S. in the territory lying between the Atlantic coast and a line drawn from South Bend, Ind., to the western border of Georgia. *Central time* extends from this line to a line drawn from the western border of North Dakota to the western border of Texas. *Mountain time* includes the region between the western limit of Central time and the western borders of Montana, Idaho, and Arizona. The remainder of the country observes *Pacific time*. The lines bounding the zones are irregular and do not follow the exact meridian lines. In addition to these zones, most of Alaska lies in the *Alaska time* zone, excepting a western strip extending from Barrow to the Alaska Peninsula, which is in the *Bering time* zone; and Hawaii lies fully in the *Hawaii time* zone.



Canada, because of its greater breadth, has six time zones, including—besides the basic four—*Atlantic time,* which embraces New Brunswick, Newfoundland, Nova Scotia, and part of Quebec; and *Yukon time,* which embraces the Yukon Territory. Canadian *Eastern time* covers the area from the western border of Atlantic time to central Ontario. *Central time* extends from this line to the central part of Saskatchewan; *Mountain time* from there to the western border of Alberta; and *Pacific time* through British Columbia.

According to this system of reckoning uniform time, places lying within the Eastern time zone have 12 o'clock, noon, when those in Central time zone have 11 A.M.; those in Mountain time zone, 10; those in Pacific time zone, 9; those in Yukon time zone, 8; those in Alaska and Hawaii time zones, 7; and those in Bering time zone, 6. A traveler passing from one zone to another finds his watch one hour too fast or too slow, according



STANDARD TIME ZONES IN THE UNITED STATES

to the direction in which he is going. All points in any time zone using standard time have their time pieces faster or slower than the time indicated by the sun, according as their time is east or west of the center of the time zone. The Naval Observatory at Washington supplies the standard time in the U.S. The exact hour of 12 o'clock, noon, is determined every day by astronomical examination, the chronometer of the observatory is corrected, and the correct time is communicated to all the government departments by telegraph or radio at the precise hour.

The correct time is indicated by a series of ticks over the telegraph spaced one second apart and commencing five minutes before 12 o'clock. Certain ticks are omitted to indicate the 30th and 60th seconds of each minute. The Navy Department sends these time signals (ticks) by short-wave radio at almost every hour of the day. It must be remembered, for instance, that the noon signal at Washington indicates time in Chicago for 11 A.M.; in Denver for 10 A.M., and in San Francisco for 9 A.M.

The Western Union Telegraph Co. also telegraphs the time signals to all of its offices in the United States for 3 minutes before 12 o'clock Eastern time. The company supplies self-winding clocks equipped with electro-magnets which force the hands to the exact hour when the time signals are received. In this way Naval Observatory time is furnished to thousands of railroad and business offices, schools, hotels, etc., throughout the U.S.

Standard time has proven a great convenience in railroading and to the traveling public, since the objections to keeping as many as 53 standards of time by railroad companies have been overcome, and the standards are now equal in number to the four regularly recognized time zones.

Daylight saving or *summer time,* originally an idea of Benjamin Franklin, sets clocks ahead one hour so as to benefit by additional sunlight hours. In effect earlier in Great Britain and other European countries, daylight saving time (from about May 1 to Oct. 1) in the United States was originally observed only by certain cities and states. During World War II a measure was passed (1941) establishing national daylight saving time, or *war time,* during the period from February 1942 to September 1945, as a means of conserving electrical energy.

Standard Weight of Coinage (*stănd'ērd wāt of koin'ĭj*), the entire contents, or the total weight, of coins as prescribed by law, including the standard fineness, or quantity of pure gold or silver, and the part of alloy used in the manufacture of coins. The minting of coins in the U.S. was established under the Coinage Act of 1792, prescribing the standard weight for the silver dollar as 412.50 grains of standard silver, nine-tenths fine, which means that the silver dollar was composed of 371.25 grains of pure silver and 41.25 grains of copper alloy; the standard weight for the gold dollar was at the ratio of 1 to 15, that is, 15 silver dollars to one gold dollar. Very little gold was coined until 1837, when a new coinage act established the standard weight of the gold dollar at 25.80 grains of standard gold, 9/10 fine, the composition being 23.22 grains of pure gold and 2.58 grains of alloy. The President, empowered by Congress, reduced the weight of the gold dollar to 15.5/21 grains, 9/10 fine, in 1934.

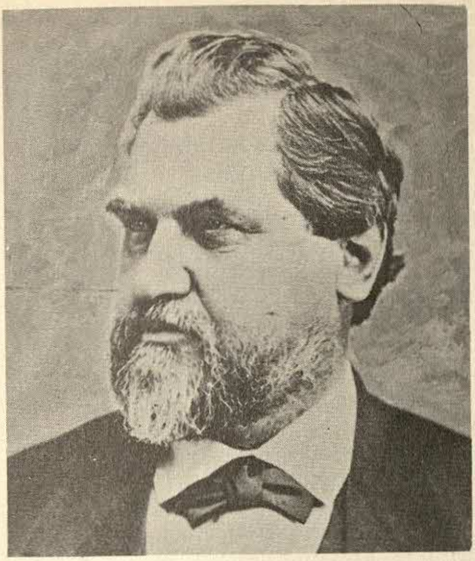
The standard weight of coins in this country as of the end of 1946 was as follows (the weight of silver coins given in grains of standard silver), silver dollars 412.50 grains, half dollars 192.90 grains, quarters 96.45 grains, dimes 38.58 grains, nickels 77.16 grains (75 per cent copper and 25 per cent nickel), and penny 48 grains (95 per cent copper and 5 per cent zinc). From October 1942 until December 1945, the nickel was composed of a silver-copper-manganese alloy. During 1943 the penny was a zinc-coated steel coin.

MILES STANDISH

Standish (*stănd'ĭsh*), MILES, colonist and soldier, born in Duxbury, England, about 1584; died in Duxbury, Mass., Oct. 3, 1656. He entered the British army for service in The Netherlands and attained the rank of captain. In 1620 he sailed for America with the Pilgrims on board the *Mayflower* and, after landing at Cape Cod, conducted an exploring expedition to discover a suitable place for the settlement. After founding Plymouth, the colony chose him as captain to command an expedition against the savages, thus making him the first military officer in New England. He visited England in 1625 as agent for the colony and the following year returned with supplies. In 1632 he founded Duxbury and was for many years a member of the executive council and treasurer of the colony. A monument 100 ft. high, topped by a statue, has been built to his memory at Duxbury. His courtship of Priscilla Mullins was commemorated by Longfellow in "The Courtship of Miles Standish."

Stanfield (*stăn'fēld*), CLARKSON, painter, born in Sunderland, England, in 1794; died at Hempstead, May 18, 1867. Of Irish parentage, at an early age he entered the navy, making voyages to China and other countries in the East. He developed considerable skill in drawing and painting while in the naval service and, after receiving an injury from a severe fall, he left the navy and painted naval scenes. He was made a member of the Royal Academy in 1835. Among his best known paintings are "The Battle of Trafalgar," "Market Boats on the Scheldt," and "Mt. St. Michael."

Stanford (*stăn'fērd*), LELAND, financier and philanthropist, born in Watervliet, N.Y., Mar. 9, 1824; died in Palo Alto, Cal., June 21, 1893.



LELAND STANFORD

After a public school education, he practiced law in Wisconsin, then went to California, settled (1856) in San Francisco, and became a prosperous merchant. One of the four founders of the Central Pacific R.R. and its president until his death, he personally superintended part of its construction. He was also president (1885-90) of the Southern Pacific Co. Stanford served (1861-63) as Republican governor and was influential in keeping California in the Union during the Civil War. From 1885 until his death he was a U.S. Senator. He founded and endowed Stanford Univ. (*q.v.*) as a memorial to his son, Leland Stanford, Jr. His wife, Jane Lathrop Stanford (1825-1905), joined in founding the university and supported it financially after the death of her husband.

Stanford University, formerly LELAND STANFORD JR. UNIVERSITY, at Palo Alto, Santa Clara County, California, 33 m. from San Francisco and 15 m. from San Jose, the county seat. It was founded in 1885 by Leland Stanford (*q.v.*) and Jane Lathrop Stanford, his wife, as a memorial to their only son, Leland, who died in 1884 in Florence, Italy, at the age of 15. The cornerstone of the main building was laid in 1887, and the institution was opened for instruction in October 1891, when it had 559 students and a faculty of 35 teachers. The normal annual enrollment before World War II was about 4,200 students. During the immediate postwar years, Stanford admitted as many as 8,300 students to help meet the emergency in higher education. Enrollment subsequently dropped to approximately 7,000. The faculty includes about 1,000 active professors and instructors.

The university campus contains 9,000 acres. The plan of the buildings was adapted from the architecture of the old Spanish missions of California. Some of the university's buildings were damaged by the earthquake of 1906, but they were restored at once.

There are seven graduate and undergraduate schools: business, education, engineering, humanities and sciences, law, medicine (including nursing), and mineral sciences. The Hoover Inst. and Library on War, Revolution, and Peace was founded by Herbert Hoover, former president of the U.S. and a Stanford alumnus. Its collections are the largest in the world on the Communist, Fascist, Nazi, and Socialist revolutions and their underground opposition. The library building includes a 285-ft. tower, containing a 35-bell carillon presented by the Belgian-American Educational Foundation. The Hopkins Marine Station at Pacific Grove, Calif., is affiliated with the university.

Stanford is administered by a board of trustees of 20 members, elected for terms of ten years, and three alumni representatives elected for five years. The university's principal endowment consists of interest-bearing securities which aggregate over $43,000,000.

Stanhope (*stăn'hōp*), LADY HESTER LUCY, philanthropist, born in Kent, England, March 12, 1776; died at Djoun, in what is now Lebanon, June 23, 1839. She was the eldest daughter of the 3rd earl of Stanhope (1753-1816). Her father was an inventor and scientist and a friend of popular government. She lived with her uncle, William Pitt, for three years; she was his private secretary and manager of his household. At Pitt's death she was granted a pension by the king of England. In 1810 she left England to search for a home in Palestine and, after extensive travels

HESTER LUCY STANHOPE

Courtesy British Information Services, N. Y.

through the East, finally settled on Mt. Lebanon. She became a Mohammedan in religion and custom, and from her seat of influence wielded almost absolute authority over the surrounding district. Arabian natives fortified and garrisoned the convent that she made her home, which became the refuge of many in need and distress, especially a large number of refugees after the siege of Acre. She came to actual financial straits because of her liberality, but was supported by her Mohammedan friends, who regarded her a prophetess.

Stanhope, PHILIP HENRY, 5TH EARL, statesman and historian, born in Walmer, England, Jan. 31, 1805; died at Bournemouth, Dec. 24, 1875. In 1827 he was graduated from Oxford and three years later entered the House of Commons, where he became influential. He was a strong advocate of the copyright law passed in 1842, and from 1845 to 1846 served as Secretary of the Indian Board of Control. In politics a Conservative, he was an intimate friend of Robert Peel and was made an earl in 1855. His numerous writings include "Memoirs of Sir Robert Peel," "War of the Succession in Spain," "Life of Louis, Prince of Condé," and "History of Spain Under Charles II." He helped found the National Portrait Gallery.

Stanislas I (LESZCZYNSKI) (*stăn′ĭs-lȧs lyĕsh-chĭn′y′skḗ*), King of Poland, born at Lemberg, Galicia, Oct. 20, 1677; died Feb. 23, 1766. He was descended from a wealthy and noble Polish family and was made palatine of Posen. In 1704 he was made King of Poland, being supported by the King of Sweden. He lost the throne in 1709 as a result of the Battle of Poltava, at which Charles XII of Sweden was defeated by Peter the Great, who restored Augustus to the throne of Poland. In 1725 his daughter Maria married Louis XV of France and he was restored to the Polish throne in 1732, but was again dispossessed by the Treaty of Vienna in 1735, which recognized Augustus III as King of Poland. Subsequently Stanislas received the duchies of Bar and Lorraine and maintained courts at Lunéville and Nancy, where he encouraged learning and gathered about him men of science.

Stanislas II (AUGUSTUS) (*ạ-gŭs′tŭs*), King of Poland, born at Wolczyn, in Lithuania, in 1732; died in 1798. He was elected to the Diet of Poland, in 1752, and subsequently represented that country at the court of Russia, where he gained the favor of Catherine. In 1763, on the death of Augustus III, he was a candidate for the throne of Poland, to which he was elected the following year. His administration was unsuccessful because of the disagreement of the nobles, and his country was thrown into a condition of anarchy. In 1795 he resigned the crown, his kingdom having been partitioned by the rulers of Austria, Prussia, and Russia.

Stanislavsky (*stăn-ĭs-läf′skȳ*), the stage name of KONSTANTIN SERGEEVICH ALEXEEV, actor, producer, and director, born in 1863 in Moscow, Russia; died there Aug. 7, 1938. He studied at the Imperial School of Dramatic Art and in 1888 became an actor and producer in the Society of Art and Literature. He was noteworthy in the plays of Chekhov and Gorki. In 1898, together with V. Nemirovitch-Dantchenko, he founded the Moscow Art Theater.

Stanislavsky broke the chains of academic representation which had ruled the European and American theater through the 19th century. He, his followers, and his imitators for the first time brought the theater in contact with modern life. Stanislavsky stretched naturalism so that it covered the physical environment, the stage setting, the whole procedure of the play. He asked his actors to live completely in their parts, to bring "art into life and life into art." He insisted that this naturalism pervade the entire play, even to the smallest detail of costume, the wicks of candles, pauses in the dialogue, noises behind the scenes. A comparison of his direction of a play by Chekhov or Gorki in 1905 and again in 1930 shows clearly that his naturalism gradually grew more subtle, that he had made a transition from a mechanical repetition of details of real life to an ordered reproduction of the essentials.

After 1920, Stanislavsky and his Moscow Art Theater went into various European countries and to the U.S., and his influence became international. He was the author of "My Life in Art" and "An Actor Prepares."

Many great directors were educated by their association with the Moscow Art Theater, the most important of them being Alexander Tairov

STANISLAVSKY

(born 1885), who in 1914 founded his own theater in which he realized his own constructivistic ideas.

Stanley (*stăn'lĭ*), ARTHUR PENRHYN, scholar and divine of the Anglican Church, born in Cheshire, England, Dec. 13, 1815; died at Westminster, July 18, 1881. He was the son of Edward Stanley (1779-1849), the rector of Alderley, and studied under Dr. Arnold at Rugby. In 1834, he was admitted to Oxford Univ., where he became a fellow, and was admitted to holy orders in 1839. The following year he made a prolonged tour in Italy, Greece, and Asia Minor, and in 1841 settled at Oxford, where he served as tutor of Balliol Coll. for 10 years. He became canon of Canterbury in 1851, was made professor of ecclesiastical history and canon of Christ Church in 1856, and became dean of Westminster in 1863. Stanley was liberal as a theologian, considering the prevailing spirit of his time, and frequently invited clergymen of the Scottish and other churches to address his congregation. His works include "Sinai and Palestine" and "Eastern Church." He was buried at Westminster Abbey.

Stanley, SIR HENRY MORTON, explorer, born in Denbigh, Wales, in 1841; died May 9, 1904. He was born in poor circumstances and at the age of three years was placed in the poorhouse of St. Asaph. His early name was John Rollands, by which he was known until he worked his way as a cabin boy to New Orleans, in 1855, when he was adopted by a merchant and took the name of his benefactor. His foster father died soon after and he entered the Confederate army, serving in several engagements, but, after being captured by the Union army, entered the U.S. navy as a volunteer. He was assigned to the ironclad *Ticonderoga* and left the service at the close of the war as an ensign. After the war he became a correspondent of the New York *Herald,* which paper sent him to Turkey in 1866 to report upon the Cretan revolution, and subsequently he traveled extensively in the Levant. In 1868 he joined the expedition against Abyssinia under Gen. Napier, and while reporting secured distinction by getting his account of the Battle of Magdala to London before the official dispatches reached there. In the latter part of the same year he proceeded to Spain to report the revolution against Queen Isabella, and while there received word from the New York *Herald* "to go and find Livingstone."

HENRY M. STANLEY IN AFRICA

Re-drawn from sketches and materials supplied by the explorer

Stanley started overland from the Crimea to Bombay, visiting and reporting different parts of Palestine, Persia, Burma, and the opening of the Suez Canal, and in January 1871, reached Zanzibar. He entered then upon his famous expedition into the heart of the unexplored region, taking with him a band of experienced natives and extensive equipment for a prolonged journey. His force consisted of 200 men and the journey occupied 234 days, being delayed somewhat on account of sickness and native hostilities. He found Livingstone at Ujiji, on Lake Tanganyika, in November 1871, greeting him with the now famous words, "Dr. Livingstone, I presume?" The two men then spent four months in exploring the great lakes sufficiently to prove that Lake Tanganyika has no connection with the Nile but belongs to the Congo basin. In 1872 he returned to England, where he received royal honors and published "How I Found Livingstone," a work that proved highly profitable. The New York *Herald* employed him to report the Ashanti campaign soon after, and he returned to England at an opportune time to witness the burial of Livingstone in Westminster Abbey.

Stanley organized a second expedition to penetrate Africa in 1874, under the joint direction of the New York *Herald* and the London *Daily Telegraph*. Leaving England in August 1874, he arrived at Zanzibar in the latter part of that year and early in 1875 reached Lake Victoria. His company consisted of 350 men, but one-third of these died while on the march to Lake Victoria. After exploring Lakes Victoria and Albert, proving the latter to be a tributary of the Nile, he proceeded across the continent of Africa and reached the mouth of the Congo in 1877. He now sailed from the mouth of the Congo to Zanzibar, where he dismissed the surviving members of his company and in 1878 reached London. The founding of the Congo Free State was a direct result of this expedition, although it was established under the protectorate of Leopold II of Belgium. Stanley was engaged soon after to explore and establish stations in that region, where he spent the five years between 1879 and 1884 and in the latter year returned to the U.S. He entered upon the famous expedition to relieve Emin Pasha in 1887.

Leaving Zanzibar in the spring of 1887 with 700 men, he proceeded to the mouth of the Congo River by way of the Cape of Good Hope, and thence followed that stream to the mouth of the Aruwimi River. After passing through a trackless forest and discovering the Ruwenzori Mts., he finally arrived at the banks of Lake Albert in January 1889, and in December of the same year Emin Pasha and Stanley reached Bagamayo. On returning to England, in 1890, he married Dorothy Tennant, made a lecturing tour in the U.S., and subsequently became a naturalized citizen of England. In 1895 he was elected to Parliament as a Unionist candidate and received a degree from Oxford. His writings include "In Darkest Africa," "Through the Dark Continent," "Slavery and the Slave Trade in Africa," "Congo and the Founding of the Free State," and "My Dark Companions and Their Strange Stories."

Stanley, WENDELL MEREDITH, chemist, born Aug. 16, 1904, in Ridgeville, Ind. He was educated at Earlham Coll. (Richmond, Ind.) and at the Univ. of Illinois, where he remained as research associate and instructor in chemistry. He was a National Research Fellow in Munich in 1930 and in the following year joined the Rockefeller Inst. for Medical Research. He has been a member of the institute since 1940. He became Hitchcock professor at the Univ. of California, in 1941, and lecturer at Princeton Univ. in 1942. He was awarded one-quarter of the 1946 Nobel Prize for chemistry for his work on the biochemistry of viruses.

Stanovoi (*stä-nô-voi′*), a range of mountains in the northeastern part of Asia, situated in Eastern Siberia. It extends from the border of Mongolia, southeast of Lake Baikal, in a northeasterly direction to Bering Strait. On the frontier of China it merges with the Altai Range to form the Yablonoi Mts. Several spurs run from the main range, including one that extends to the Sea of Japan and another that runs parallel with the Lena River almost to the Arctic Ocean. The culminating peak is Mt. Tehokhondo, or Sokhondo, in the southern part, which has an altitude of 8,150 ft. The range has a length of 3,000 m. and the general elevation does not exceed 3,250 ft. Fine forests of valuable timber cover many of the slopes in the southern part, but the extreme northern extension is entirely barren or is characterized by a small growth of shrubs.

Stanton (*stăn′tŭn*), EDWIN MCMASTERS, statesman, born in Steubenville, O., Dec. 19, 1814; died Dec. 20, 1869. After being graduated from Kenyon Coll. at Gambier, O., he studied law and in 1836 was admitted to the bar. He first practiced law at Cadiz and later at Steubenville, and was soon appointed reporter of the supreme court of Ohio. In 1848 he located in Pittsburgh to practice law, and removed his office to Washington in 1859. The following year, President Buchanan appointed him Attorney General of the U.S. During this period there was intense excitement, owing to the withdrawal of the U.S. troops from Charleston harbor. At the accession of President Lincoln he resumed the practice of law. When Simon Cameron resigned as Secretary of War to accept the mission to Russia, Lincoln selected him as Secretary of War. His administration of that department was very energetic and, when Johnson succeeded to the Presidency, serious difficulties arose, which finally caused his suspension in 1867. Congress restored him in 1868 and the House of Representatives impeached the President, but Stanton resigned in the same year, receiving from Congress a vote of thanks for faithfulness and efficient services. President Grant appointed him a justice of the Supreme Court, but he died before entering upon the duties of that office. His son, Louis M. Stanton, published "Memoir of Edwin M. Stanton."

Stanton, ELIZABETH CADY, suffrage leader, born in Johnstown, N.Y., Nov. 12, 1815; died Oct. 27, 1902. She was the daughter of Daniel Cady. The inequality of women in matters of law and politics first came to her notice while in the office of her father. In 1840 she was married to H.B. Stanton, and in 1848 joined Lucretia Mott (1793-1880) in organizing the first woman's convention at Seneca Falls, N.Y. Subsequently she became noted as an able advocate of woman's rights, lecturing and writing extensively on that subject. In 1888 she served as president of the International Council of Women. She joined Susan B. Anthony and Matilda J. Gage in publishing "History of Woman's Suffrage." Her husband, HENRY BREWSTER STANTON (1805-87), was an able journalist. He first served as writer for the Rochester *Monroe Telegraph,* joined the anti-slavery movement, and in 1840 attended the anti-

ELIZABETH CADY STANTON

slavery meeting in London. Soon after returning to the U.S. he became editor of the New York *Sun.*

Staphylococci (*stăf-ĭ-lō-kŏk′sī*), in medicine, a kind of bacteria which appears in clustered form, causing pus to develop.

Starch (*stärch*), AMYLUM, $C_6H_{10}O_5$, one of the polysaccharides, which are a group of the carbohydrates (*q.v.*). Starch is the most abundant carbohydrate in nature, and it is always present in seeds and tubers of plants. It is also found in stems and leaves. Plants store their carbohydrate materials in the form of starch, and during the growth process starch may be changed to sugars or vice versa. For example, green apples and bananas contain starch which changes to sugar as the fruit ripens, while young corn and peas contain sugar which changes to starch as the plants mature. The size and pattern of starch grains vary according to their source, whether from potatoes, corn (maize), arrowroot, oats, wheat, tapioca, rice, buckwheat, rye, or barley, etc., but each grain consists of a shell or cover of *amylopectin* or *alpha-starch,* which is fairly insoluble; and an inner material consisting of *amylose* or *beta-starch* which is more soluble. When tested with iodine, alpha-starch takes on a violet color, and beta-starch a blue color. When starch granules are heated with water, the outer shells burst and the starch goes into a colloidal suspension in the water, forming a jelly.

Pure starch is a tasteless white powder, which "squeaks" when rubbed between the fingers. Its specific gravity is 1.5. It does not melt, but burns when heated. It is insoluble in cold water, alcohol, or ether. Commercial starch is prepared from corn by first soaking the grain in a weak solution of sulfurous acid to soften the hull. It is then coarsely ground and mixed with water. The germ of the corn floats and is removed to be pressed for its oil. The remaining material (consisting of gluten, starch, and hulls) is then finely ground, mixed with water, and allowed to flow slowly through long troughs. The heavier starch grains sink to the bottom of the trough; the gluten and cellulose of the hulls are washed away. The starch is then removed from the troughs and dried. Starch is also prepared from potatoes, wheat, rice, tapioca, cassava, etc. It has many commercial applications, such as: for stiffening (starching) fabrics, sizing paper, and finishing cloth; in pastes; as dusting powders and face powders; for human and animal foods; chemically as a reagent and indicator for iodine; medically as an antidote for iodine; and as a raw material from which corn syrup and glucose are made; and, when nitrated, in explosives.

When starch is heated with hydrochloric acid, its complex molecular structure is broken down into simpler molecules with which water combines to produce the simple sugar, *glucose* ($C_6H_{12}O_6$). If the reaction is not completed, an intermediate carbohydrate, *dextrin,* is produced. Dextrin is a constituent of corn syrups, and is also used as an adhesive, particularly on postage stamps. Glucose is used in medicine, in the manufacture of confectionery and foods, and as a fermentation-producing material in the manufacture of alcoholic beverages.

Dextrins are also produced from starch by the action of heat or enzymes. When starch is eaten, the saliva and pancreatic juices break it up into dextrins, and the hydrolysis of dextrins by further digestion yields glucose, which is absorbed and carried by the blood to the muscles and other tissues to be used as energy or stored as glycogen in the liver. An excess of starch in the diet, above energy requirements, is also converted by the animal body to fat and stored in the tissues.

Starfish (*stär′fĭsh*), a class of marine animals which have a starlike body composed of a central disk extending into five or more rays. They belong to the radiates, a class of animals having a central focus with raylike projections and the body covered with a leathery skin. The mouth is in the center, at the under side, and from it is an opening into the stomach, which extends by two branches into each ray. Movement is effected by peculiarly formed tubular feet, which are protruded against the bottom, where they crawl in search of food. At the end of each ray is a reddish speck, which is the eye, but its sensitiveness to light is not highly developed. Reproduction is by eggs, of which vast numbers are laid in the spawning season. Starfishes are greedy eaters and in many places prove a pest by devouring the bait of fishermen. They are widely distributed in tropical seas, assuming smaller forms toward the colder waters, and extend in the Atlantic from Mexico to Greenland. They vary in diameter from 1 to 15 in. Fossil starfishes occur as early as the lowest Silurian epoch, whence they continue to the present time.

Stark (*stärk*), HAROLD RAYNSFORD, naval officer, born in Wilkes-Barre, Pa., Nov. 12, 1880. After being graduated from the U.S. Naval Acad. in 1903, he saw service in various naval stations and during World War I was an aide on the staff of Adm. William Sims. He served as chief of the bureau of ordnance (1934-37) and then as commander of a cruiser division of the U.S. Navy (1937-39). Promoted to the rank of admiral in 1939, he held the post of chief of naval operations until 1942, when he was named commander of the U.S. Navy forces in European waters. He retired in August 1945.

Stark, JOHANNES, physicist, born in Schickenhof, Bavaria, Germany, April 15, 1874; died in Traunstein, June 21, 1957. Educated at the Univ. of Munich, he later taught at various German institutions, including the universities of Greifswald and Würzburg, and was president of the Reich Physical-Technical Inst. (1933-39).

In 1904 he founded the "Yearbook of Radioactivity and Electronics." He was chiefly interested in the theory of radiation and of atoms. In 1919, he won the Nobel Prize for physics "for his discovery of the Doppler effect in Canal rays, and of the decomposition of spectrum lines by electric fields." This latter discovery was called, after him, the Stark effect. He wrote "Electricity in Gases" (1902), and "Change of the Structure and the Spectra of Chemical Atoms" (1920).

Stark, JOHN, general, born in Londonderry, N.H., Aug. 28, 1728; died in Manchester, N.H., May 8, 1822. Of pioneer parentage, his early life was spent in the frontier region of New Hampshire. The Indians captured him as a youth and adopted him into the St. Francis tribe. In the French and Indian War, in 1858-59, he served as captain, and at the beginning of the Revolution raised recruits to assist the colonies. After serving with ability at the Battle of Bunker Hill, he led a colonial force into Canada, and subsequently served at Trenton, Princeton, and Bennington. The Continental Congress promoted him to the rank of brigadier general after the last-mentioned battle, but in the latter part of 1777 he resigned his command. When Burgoyne's invasion called out the New Hampshire militia, the soldiers demanded him as a commander, and he prevented that general's retreat from Saratoga. Later he served in Rhode Island and New Jersey, and in 1781 was made commander of the northern department. "The enemy must be beaten, or Molly Stark will be a widow," is a remark attributed to him at the Battle of Bennington.

Starling (*stär'lĭng*), a genus of birds allied to the crow family. They occur in Europe, Asia, the U.S., and Africa. The bill of the common European starling is long and pointed, the color is blackish with shadings of green and purple, and at the extremity of the feathers is a whitish speck. The female has less beautiful plumage than the male, and both sexes are more speckled in winter than in summer. This species is found in all parts of Europe, except the extreme north, and in most parts of Asia and Africa. The nest is built of twigs and grass, usually in hollow trees and old walls. Several species build in boxes provided for them near houses. They can be taught to speak some words and whistle tunes when confined in a cage. The *meadow lark* (*q.v.*) of North America is an allied bird, but is larger than the European starling.

Star of Bethlehem (*stär of bĕth'lē-ẹm*), a bulbous-rooted plant of the lily family, resembling the hyacinth. The leaves are narrow and the flowers are variously colored, usually white or yellow, and are quite fragrant. Many species have been described, some being extensively cultivated in flower gardens. Those best known are native to France, Switzerland, and Germany. Several species are indigenous to Asia and Africa. The flowers open at 11 A.M. and close at 3 P.M., for which reason they are sometimes called *Johnny-go-to-bed.*

Star Route (*stär rōōt* or *rout*), the name given in the U.S. to the postal lines over which the mail is not carried by rail, water, or air, and, instead, is conveyed by horse and wagon, on horseback, or by motor vehicle. They are so named because in the old route books of the Post Office Dept. they were marked with a star (*). The term "star route" originated in early days when all records were made in handwriting; all routes for mail transportation were listed together, and those for which no mode of conveyance was specified were designated by a star. Routes of this kind are numerous in the mountains and in sparsely settled districts, but short distances are covered by the mail service in this way even in more populous districts. In 1881, during the administration of President Hayes, certain frauds, known as the *Star Route Frauds,* were discovered and exposed in connection with this service by the government. Those interested in these frauds had increased the compensation for carrying the mails from $143,169 to $622,808, and the profits were divided among the large contractors and some government officials. Those implicated included Thomas J. Brady, Second Assistant Postmaster General; Stephen W. Dorsey, Senator from Arkansas; and a number of subordinates in the Post Office Department. Dorsey and Brady were tried, but not convicted, and only one of a large number indicted was ever punished. However, the irregularities complained of were ended and the combination was broken up.

Stars (*stärz*), heavenly bodies situated outside of the solar system, which differ from the planets by being self-luminous. They are so remote that even the strongest telescopes fail to show an appreciable diameter. Their characteristic twinkling is purely an atmospheric phenomenon, where the presence of vapor, ice, and dust particles interferes with the normal transmission of the slender beam of light received by the eye. In the case of the planets the various parts of the appreciable disk, shown even by the small telescopes, do not twinkle in phase, so that their light is steady except near the horizon.

The ancients called the stars "fixed" in contrast to the wandering "planets." We know now that all stars are in motion, some moving very rapidly, but owing to their great distance the motions are so small so that they remained undetected until modern times.

The description of the sky is facilitated by grouping the stars in "constellations," most of which have been in use for many centuries, as is evident from their mythological names. Ptolemy's star catalogue divided the sky into 48 constellations, 12 of which, covering the yearly path of the sun, make the animal ring or *Zodiac.*

The brighter stars have names of Greek, Latin, or Arabic origin. The others are designated by the name of the constellation preceded by a Greek letter assigned in the sequence of the brightness. The many fainter stars are designated by their number in one of the catalogues or simply by their position on the stellar sphere.

Spectral analysis of the light of the stars has made it possible to classify them in a sequence from the hottest blue stars through the white, the yellow (like our sun), to the red stars, which are at the lower end of the temperature scale. The brightness of the star is indicated by a number called "magnitude"; about 20 of the brightest ones are called first-magnitude stars. Those that are at the limit of naked-eye visibility are called sixth-magnitude stars. With the introduction of the telescope this arbitrary scale was extended to fainter stars, and it is the purpose of "stellar photometry" to measure the brightnesses with precision. In the largest refractor in existence stars down to magnitude 16 can be observed, while photographic methods applied to the largest reflector have made it possible to reach magnitude 21.

Not more than 6,000 stars are visible to the naked eye over the whole sky and not even half as many can be seen from a given station. It has been estimated that with the largest telescopes available some 3,000,000,000 can be recorded at present.

From the general trend of the motions of the stars it has been concluded that our sun also has a motion, which carries the solar system at the rate of 13 m. a second toward the constellation of Hercules.

The stars are so far away that in ordinary usage their distances are given in light-years (*q.v.*). Thus the nearest star, Centauri, in the southern hemisphere, is four light-years away.

When the distance of a star is known, its apparent brightness can be transformed into true brightness. In this way it has been established that some stars, called "giants," are many thousand times brighter than the sun, while others designated as "dwarfs" are sometimes much fainter.

When examined with the telescope many stars are found to be double. The great majority of these *double stars* are physically connected and slowly revolve around their common center of gravity. Their motion and separation gives a clue to their mass.

Some stars, instead of shining steadily with the same brightness, show fluctuations in their light. Among these *variable stars* we distinguish short and long period ones, irregular ones, and also *new* or *temporary stars* (see *Nova*). Stars are concentrated toward the *Milky Way* or *Galaxy*. They are considered as forming a huge flat system of some 100,000 light-years in diameter, slowly revolving as a whole around a center situated in the constellation of Sagittarius. See *Spiral Nebula.*

Stars and Stripes (*stärz and strīps*), a popular term for the flag of the U.S., in which stars are used to indicate the number of states and stripes the 13 original colonies. It was also chosen as the title of an army newspaper published for the armed forces in World Wars 1 and II. By analogy, the flag of the Southern Confederacy, part of whose design was a St. Andrew's Cross, was known as the "Stars and Bars."

STARS AND STRIPES OF 1814

Star-Spangled Banner (*stär′spăn-g′ld băn′-ẽr*), THE, national anthem of the U.S. The words were written on Sept. 14, 1814, by the American, Francis Scott Key. Key, who had been detained aboard a British frigate, was released Sept. 12 and taken to an American sloop. From this vantage point he watched the British bombardment of Ft. McHenry, Md., and was inspired to write the poem when he saw the American flag still waving "in the dawn's early light." The words were adapted to the tune "To Anacreon in Heaven," composed by John Stafford Smith *ca.* 1770. "The Star-Spangled Banner" became the U.S. national anthem by act of Congress in 1931.

Starvation (*stär-vā′shŭn*), a condition of exhaustion and wasting of body tissue resulting from lack of food, culminating in death if prolonged. Slow starvation is caused by inadequacy in the quantity of nourishment or by the lack of proper balance in the diet. The absence of both food and water causes death in human beings in from five to ten days, depending upon climatic conditions and the age and vitality of the individual; if water is available life may be supported for a longer period. Voluntary fasts (abstinence from food but not from liquids) have lasted for 60 days or more. In cases of starvation, body weight is usually reduced to three-fifths of normal before death ensues. The body contains a large percentage of adipose tissue, which serves to sustain life, and waste is reduced to a minimum by the reduction in the rate of breathing and of heartbeat. Among the intermediate effects of starvation are a softening of the mucous membranes, loss of ability to resist cold, severe pain in the head and stomach, and, finally, convulsions. Adults usually resist starvation longer than the young.

Stassen (*stăs′ẹn*), HAROLD EDWARD, politician, born in West St. Paul, Minn., April 13, 1907. He was graduated from the Univ. of Minnesota (1927) and Minnesota Coll. of Law (1929). After two terms (1930-38) as attorney of Dakota County, he was elected governor of Minnesota at 31, the youngest governor ever elected in the state. He was re-elected twice but resigned in 1943 to join the U.S. Navy, serving as assistant chief of staff to Adm. William Halsey. In 1945 he was a member of the U.S. delegation to the U.N. Charter Conference. He was president of the Univ. of Pennsylvania (1948-53) and between 1944 and 1952 was mentioned as a Republican candidate for President. He was director of the U.S. Foreign Operations Admin. (1953-55) and special assistant to the President (with cabinet rank) to direct U.S. studies of disarmament (1955-58). In 1958 he made an unsuccessful attempt to get the Republican nomination for governor of Pennsylvania and, in 1959, ran for mayor of Philadelphia. He wrote "Where I Stand" (1947).

State (*stāt*), the term applied generally to a community that is organized under permanent law and has an independent government. The conditions of organization are numerous, differing vastly in form, but the purpose of the state is universally to maintain justice and the security of all its members. In a certain sense it is co-operative, especially where the right of suffrage is general or at least vested in a large part of its citizens. With regard to its character, it is said to be paternalistic or individualistic, depending upon whether the state discharges functions that relate to the close supervision of industries and public utilities, or confines itself to the maintenance of peace, the punishment of crime, and the perpetuation of itself as a commonwealth.

In ancient times, Plato and Aristotle, as well as others of high repute, held the view that the city should be the nucleus of the state, giving form and character to the public mind by reason of its higher advancement in arts and education. During the Middle Ages a powerful sentiment developed in favor of an alliance between the church and state; this was discussed by such writers as Aquinas and Dante. Machiavelli, on the other hand, sought to divorce politics from theology and ethics, and advocated a strong, central, monarchical government. Natural rights were made the basis of government in the theories of Locke and Rousseau, while Thomas Hobbes used the theory of natural law to defend absolutism. These writers sought to solve the problem of government without making history a primary basis, while Montesquieu referred political science to the history of past events, upon which he based his theory of government.

Some countries such as the U.S. of America and the Commonwealth of Australia are divided into political divisions known as *states*. However, the word states in this sense is a designation of a constituent division rather than that of a political organization with full sovereignty. The states referred to lack many of the powers of an independent government, such as declaring war and making final decision in judicial causes of a national character, these powers being reserved by the central or federal government. The name *province* as used in Canada is equivalent to the word *state* as used in Australia as well as in the U.S.

State, DEPARTMENT OF. See *United States, Departments of.*

State Guards (*stāt gärdz*). See *National Guard.*

Staten Island (*stăt′ẹn ī′lạnd*), an island in New York bay, about 5 m. s. of Manhattan Island, between the southern part of Brooklyn and the State of New Jersey. It is bounded on the s. by the Lower Bay, on the w. and N.W. by Arthur Kill and the Kill Van Kull, on the N. by the Upper Bay, and on the E. by the Narrows. Roughly triangular in shape, it is 13.9 m. long, 7.3 m. across its widest part, has an area of 57 sq. m., and has 35 m. of waterfront. In 1898, it was annexed to New York City and became the borough of Richmond; it is also coterminous with Richmond County, New York. Physically and economically it is more closely related to New Jersey than to New York. An old legend claims that in the early days, when the islands in the bay were disputed property, an agreement was made which provided that if Staten Island could be circumnavigated (by sail) within 24 hours it would become the property of New York. Capt. Christopher Billopp succeeded in making the circuit in 23 hours and 57 minutes.

Ferry systems connect Staten Island with Manhattan, Brooklyn, and the mainland; four bridges connect it with New Jersey. All parts of the borough are accessible by buses, and an electric rapid-transit line extends along the north, east, and south shores.

Staten Island, besides being in part a semi-rural residential neighborhood, contains extensive woodland areas and parks, popular for hiking and picnics. The central and southern part of the island contains many truck farms. Notable buildings are Conference House, at Tottenville, where American and British emissaries (including Benjamin Franklin) discussed terms for shortening the Revolutionary War; the old courthouse at Richmond, the former county seat; and St. Andrew's Church, also at Richmond, one of the finest old buildings in the New York area.

The north and west shores of the island are highly industrialized. The shipyards are important; their work ranges from the building of small craft to repair of naval vessels. Population, 1950, 191,555; in 1960, 221,991.

States-General (*stāts′jĕn′ẽr-ạl*), the name of the legislative body of The Netherlands. It is composed of two chambers, an upper and a lower, members in the former being elected by the provincial states and in the latter by the citizens. In French history, the name of states-general refers to an assembly made up of the nobility, the clergy, and the third estate, or *bourgeoisie*. It is thought to have originated with Charlemagne, but the first assemblage of which there is an authentic record is that of 1302, which was convoked by Philip the Fair, to aid him in his struggle with Pope Boniface VIII. Because of increasing powers of the King, there was no general convocation of the states-general from 1314 to 1614, and after that none until 1789. In the latter year, however, the Third Estate refused to abide by the regulation agreed upon between the other two orders, which forbade the convening of the body, and formed themselves into the national assembly, which for some years remained the governing body of France. See also *France:* HISTORY.

States' Rights (*stāts rīts*), the doctrine that every state of the U.S. is sovereign within the limit of its own sphere of action, made so by the declared will of the nation as expressed in the Constitution, and that the nation may not abridge or abrogate that sphere. The rights of the national government are distinctly stated in the Constitution, and the rights of the states are limited only by the expressly declared national rights. All concede that both the nation and the states have certain rights, and both have more or less clearly defined powers. The term has often been misapplied to the doctrine of *state sovereignty,* which implies that the states, at the formation of the Union, delegated a portion of their sovereignty to the national government, reserving the right to revoke the agency and resume full sovereignty at any time by seceding.

State sovereignty was first asserted by the legislatures of Virginia and Kentucky, in 1798, when they formally protested against the Alien and Sedition Laws, by which the President was empowered to punish sedition in the states and to remove any alien or foreigner whose presence was considered a source of danger. The doctrine was asserted by Henry Clay and the state of Maryland in 1811 and in 1819; they declared that Congress did not possess authority to charter the U.S. Bank. South Carolina in 1832 declared the high protective tariff null and void, but trouble was averted by Clay's Compromise Bill. The doctrine of state sovereignty became the ally of slavery, and the Southern states carried into effect its principles by seceding from the Union, but the Civil War greatly modified the doctrine. However, it still has a place in public questions, and, as late as the 1930's, the U.S. Supreme Court ruled that the Constitution empowers Congress to pass legislation on commerce affecting interstate commerce only. The term *States' Rights Democrats* was applied to those who broke away from the Democratic party in 1948 because they disapproved of the "civil rights" plank in the party platform.

Static (*stăt′ĭḳ*), in radio terminology, any noise or interference affecting the proper reception of a transmitted signal. Static is frequently caused by atmospheric disturbances or nearby electrical devices and appliances.

Statics (*stăt′ĭḳs*), the branch of dynamics which treats of forces that counterbalance one another, and so produce no motion or change of motion. Some writers use the word statics in opposition to dynamics, in which sense the former is the science of rest, of equilibrium, and the latter that of motion, both together constituting mechanics. See also *Mechanics; Radio.*

Stations of the Cross (*stā′shŭnz, ḳrŏs*), in theology, the series of 14 crosses which represent the way of Christ's passion, maintained in many Roman Catholic churches and in open country as well as places of prayer. To fix the order of this devotional exercise, the individual stations are decorated with pictorial representations of events in the passion of Christ (*q.v.*). Thus the series of 14 stations gives the complete narrative of the passion.

Statism (*stăt′ĭz′m*), that condition of society in which many economic and political aspects of the life of the private citizen are dominated and controlled by a centralized government. The term is sometimes used—although wrongly—for welfare state (*q.v.*).

Statistics (*stȧ-tĭs′tĭks*), the science which is concerned with the collection, organization, presentation, analysis, and interpretation of numerical data. Sometimes the word statistics is used in a narrower sense as a synonym for "data"; for example, "the statistics for loss from fire have shown an upward trend in the past five years."

The collection of data, largely for governmental use, such as determining the number of men able to bear arms or pay taxes, goes back to ancient times, for example, in the book of Numbers in the Bible. The word statistics itself was first used in the 18th century to describe "the political arrangements of the modern states" and, because of the increasing importance of numerical data in such a description, the word statistics finally took on the quantitative meaning that it has now. Modern statistics is often said to have begun with the Belgian astronomer and statistician, Adolphe Quetelet (1796-1874).

The subject matter of statistics is often divided into descriptive statistics and statistical inference. Descriptive statistics is concerned with describing concisely, by means of such things as a few specially defined measures, or by means of a graph, or by means of an equation, the characteristics of a set of data so large that the general characteristics are obscured by the numerous data. Topics often discussed and described later in this article are: averages, measures of dispersion, correlation, and trends. Statistical inference is concerned with generalizing from a set of observed data, called the sample, to a larger unknown population which has not been observed. Public-opinion polls are well-known examples of the use of statistical inference. In a pre-election poll, for example, a carefully selected sample of the population is polled and the results are used to predict the results to be expected in the election.

The average man with his opinions, earnings, home life, choice of clothes, interests, etc., is probably the most talked about nonexistent man. Quetelet, 100 years ago, described the average man as one in whom "all processes correspond to the average results obtained for society" and who "could be considered as a type of the beautiful." On Aug. 1, 1945, the New York *Sun* described "the average American male" as one who "starts the morning with coffee, prefers cold showers, marries at 27, has his first child at 32 . . . consumes 150 pounds of meat a year, uses 216,000 words per day . . ." What is meant by the word average?

In elementary statistics it is pointed out that there are five different kinds of averages. Often the word average is used to mean the *arithmetic mean*. For example, a man's average earnings during the last five years is the sum of his earnings during these five years divided by five. Sometimes the word average means the value of the item in the middle of the list of items when they are arranged according to size. To distinguish this average from the others it is called the *median*. For example, if seven boys line up according to height, the boy in the middle is said to have the median height. At other times the word average means the most popular item, the one of greatest occurrence, the most fashionable or stylish, and hence this average is called the *mode*. For example, the mode is the average used when the average American male is described as starting the morning with coffee. The other two averages, the *geometric mean* and the *harmonic mean*, are of importance in special situations and are not generally used by the nonstatistician. The use of each different average is in part apparent from its definition, and further discussion of the uses, advantages, and shortcomings of each type of average are discussed in statistics.

An average tells us much about a large group of data, but it is desirable to describe certain other characteristics of the group as well. For example, consider the two fictitious communities *A* and *B* in which the number of people receiving the annual incomes listed in the first column of the table are given in columns headed *A* and *B*.

ANNUAL INCOME	*A*	*B*
1000	0	10
2000	0	20
3000	0	30
4000	50	40
5000	200	100
6000	50	40
7000	0	30
8000	0	20
9000	0	10
Total	300	300

In each community the average income, whether it be computed as the arithmetic mean, the median, or mode, is $5,000; yet the range of the incomes in the two communities is quite different. In order to describe this situation briefly, some measure of how the incomes are spread or dispersed is needed. There are many measures of dispersion associated with each type of average. One simple and obvious one is to to state the entire range; for example, we might describe communities *A* and *B* by the statement that in each community the average annual income is $5,000, but in community *A* all people had incomes from $4,000 to $6,000 while in community *B* their incomes were from $1,000 to $9,000. This has the disadvantage of placing too much emphasis on the end values, and so some measure of dispersion that takes into account less than the full range is usually used. When the average employed is the median, the range in which the middle 50 per cent of the items, called the *semi-interquartile range*, is often used as the measure of dispersion. When the average used is the arithmetic mean, the most common measure of dispersion is called the *standard deviation*. This is the square root of the mean value of the sum of the squares of the deviations from the mean. In spite of its somewhat formidable definition, it is one of the most useful measures of dispersion. In a set of data which is a normal frequency distribution, as are many sets of natural data—for example, the heights of all white men in the U.S.—a range of one standard deviation above and below the mean includes approximately the middle 68 per cent of all items in the distribution.

Two other measures of a large group of data are used: one, called the *skewness,* which measures the lack of symmetry in a distribution, and another, called the *kurtosis,* which measures the concentration of the data in the neighborhood of the mode. The average, the dispersion, the skewness, and the kurtosis are the four measures which are commonly used to describe a large group of data in brief terms.

It sometimes happens that two sets of data behave in similar or in opposite ways. For example, we might observe that the yield of crops is increased as the fertility of the soil is increased, or that the number of gallons of gasoline sold increases as the amount of clothing sold increases. In the first case we can see that the increased fertility may be the cause of the increased yield, but in the second case no such simple explanation is involved, and so we seek to see if there really is a co-relationship or *correlation* between them. To measure this relationship a number called the coefficient of correlation is defined. It is quite useful in many fields, especially in psychology and in education. For example, one might measure the correlation between the grades of students in mathematics and in science, or between the grades of students in mathematics and in foreign languages.

The subject of trends is one of quite common interest. How many people will there be in the U.S. in 1970, 1980, etc.? How will average wages change in the future? How will the cost of living change? Everyone makes some predictions of this type and plans his life in relation to his forecast. In elementary statistics, the subject of simple types of trends, such as linear, exponential, and parabolic trends, is considered.

As has been indicated above, the methods of statistics are of use in the social, natural, and physical sciences; however, the methods of statistics are the same regardless of the field to which they are later applied. The logical derivations and extensions of these methods involve advanced mathematics, and they are studied in the theory of statistics.

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STATUE OF LIBERTY

Statue of Liberty (*stăt′ū of lĭb′ẽr-tȳ*), a national monument on Liberty Island in New York Harbor, presented by France to the U.S. in 1884. Executed by Frédéric Auguste Bartholdi (*q.v.*), the statue was erected in 1886. The female figure symbolizing liberty carries a torch in its right hand, and in its left arm a book bearing on it the date July 4, 1776, commemorating the signing of the Declaration of Independence. In May 1903, a poem by Emma Lazarus, "The New Colossus," was inscribed on the inside of the base.

Statute (*stăt′ūt*), a law established by the act of a representative assembly, such as a legislature, congress, or parliament. Statutes enacted by the lawmaking branch of the general government are termed *national,* while those of a state or province are called *state,* or *provincial,* statutes. Where a statute is enacted by the legislature of a state or province, it must necessarily be in conformity with the written or understood constitution of the nation, otherwise it is void on account of being unconstitutional. A statute is said to be *mandatory* when it directs the performance of an act, as in the case of public officials or in authorizing the organization of corporations; *prohibitory,* when it forbids the commission of an act; *directory,* when it does not definitely specify certain acts, as the time and manner of filing certain official reports; and *permissive,* when it leaves certain acts of a citizen optional, as the disposition of property by will.

Statutes of Limitation (*stăt′ūts of lĭm-ĭ-tā′-shŭn*), in Federal and state law, statutory provisions limiting the time during which a plaintiff may bring an action or proceeding before the law on certain described causes of action, or during which he may claim certain rights. The statutes limiting the time for action vary in most of the states of this country.

Staubbach (*shtoup′bäk̨*), a waterfall near Lauterbrunnen, in the Bernese Alps of Switzerland. About 980 ft. high, the fall is one of the highest in Europe. The German name means "dust stream," and refers to the dusty appearance of the falling spray.

Staunton (*stăn′tŭn*), an independent city of western Virginia, county seat of Augusta County, 110 m. w. of Richmond. Lying in the Shenandoah Valley halfway between the Blue Ridge Mts. on the west and the Allegheny Mts. on the east, Staunton is served by the Chesapeake & Ohio and Chesapeake Western R.R.'s, and is the trading center for an agricultural region. The city has manufactures of furniture, clothing, woolens, flour, and dairy products. It is the seat of Mary Baldwin Coll. (for women) and Staunton Military Acad., and was the birthplace of Woodrow Wilson. Western State Hospital and the Virginia school for the deaf and blind are located here. First settled in 1738, Staunton was briefly the capital of Virginia (1781). It was incorporated as a town (1801) and as a city (1871). Staunton was the first city to adopt (1908) the city-manager form of municipal government. Population, 1940, 13,337; in 1950, 19,927.

Stavelot (*stä-vlō′*), a town of southeastern Belgium, in Liége province, on the Ambleve River 21 m. S.E. of Liége. A Benedictine abbey, founded in 651, was the nucleus around which the town grew. Under the Holy Roman Empire the abbots enjoyed princely rank, until the secularization of their lands in the French Revolution. In World War II Stavelot was captured (December 1944) and held briefly by the Germans in the Battle of the Bulge. Population, *ca.* 4,000.

Stavenger (*stä-văng′ẽr*), a city of southwestern Norway, capital of Rogaland county, 190 m. s.w. of Oslo. Stavanger is on Stavanger Fjord, a southern branch of Bokn Fjord, and is a major seaport, carrying on extensive trade with Great Britain and the Continent. It is the terminus of the railroad from Oslo and Kristiansand and has a large airport at Sola. Stavanger is the center of the Norwegian fish-canning industry; the city also has shipyards, textile and steel mills, and woodworking plants. The Cathedral of St. Swithin, begun in the 11th century and restored in the 19th, is an outstanding example of northern Gothic architecture. Stavanger is one of Norway's oldest cities; it was founded in the 8th century. In 1684 a fire destroyed much of the city. In World War II it was occupied by the Germans on the first day (April 9, 1940) of their invasion of Norway. Population, 1950, 50,647; including its suburbs, 75,000.

Stavisky Affair (*stä-vē-sk̨ē′ ạ-fâr′*), a financial and political scandal that rocked France in 1934. Serge Alexandre Stavisky, a Russion-born swindler, who operated the municipal pawnshop at Bayonne, sold worthless bonds to workers of the poorer classes for tens of millions of francs. When his fraud was discovered (December 1933) and he was threatened with exposure, he fled to Chamonix, where, in January 1934, he committed suicide or, as some claim, was murdered by the police. In the ensuing uproar the government, headed by Camille Chautemps, was accused of corrupt complicity with Stavisky and was forced to resign. The succeeding premier, Édouard Daladier, used force to suppress bloody riots in the streets of Paris, which were instigated by Rightist organizations to embarass the government; the Communists, in turn, called out their followers, and for a while France seemed on the verge of civil war. Daladier consequently resigned and was replaced by a national union cabinet under Gaston Doumergue. A long trial (1935-36) resulted in acquittal for 11 of the 20 defendants, including Stavisky's widow, and a parliamentary investigation of the scandal produced no startling revelations.

Stavropol Territory (*stăv′rô-pôl tĕr′ĭ-tō-rĭ*), an administrative subdivision of southeastern European Russian S.F.S.R., extending north from the Caucasus Mts., it comprises 2,950 sq. m. The western and central part of the territory is a high plateau; the eastern section is a level plain, drained by the Kuban and Kuma Rivers. Since 1945 the territory has been systematically irrigated and produces wheat, corn, and cotton. Along the Kuma River fruit and vegetables are grown. The inhabitants of the territory are mainly Russians and Ukrainians, with a few seminomadic tribes of Tatar herdsmen. The principal cities are Stavropol, Pyatigorsk, and Georgievsk.

Stavropol, the capital city, is a major agricultural center, with meat-packing, flour-milling, and machinery industries. It was founded in 1776 as a military post by the Russians, who used it as a base for their subsequent conquest of the Caucasus region. In World War II it was held by the Germans from August 1942 until January 1943. Between 1940 and 1944 the city was called Voroshilovsk. Population of the territory, 1946 est., 1,500,000; of the city, 85,100.

Stead (*stĕd*), WILLIAM THOMAS, journalist and author, born in Embleton, Northumberland, England, July 5, 1849; drowned in the sinking of the *Titanic,* April 15, 1912. After an early apprenticeship in a merchant's office he turned to journalism, becoming editor (1871) of the Darlington *Northern Echo.* In 1880 he became assistant editor, under John Morley, of the *Pall Mall*

Gazette, serving as editor (1883-89) after Morley's retirement. Stead did much to introduce modern journalistic methods to England. He took a vigorous part in movements for child welfare, naval reform, and social legislation and was imprisoned for three months in 1885 for his attacks on government policy toward organized vice. In 1890 he founded the *Review of Reviews,* establishing similar publications in the U.S. (1891) and Australia (1892). His many books include "If Christ Came to Chicago" (1893) and "The Americanization of the World" (1902).

Steam (*stēm*), the gaseous form of water, transparent and colorless in appearance and pure H_2O in composition. Water evaporates into the air at all temperatures forming a gaseous phase in which the molecules of water are mixed with air, but such a mixture is not usually called steam. The term is most frequently applied to pure water vapor at or above 100° C. and at atmospheric pressure or greater. Steam may exist in equilibrium with liquid water at the boiling point of the latter and is called *saturated steam* irrespective of whether the liquid phase is present in a large quantity, as in a boiler, or in the form of small droplets resulting from partial condensation of the steam. Before steam is used for generating power it is called *live steam,* but after passing through the steam engine, it is called *exhaust steam* and usually contains droplets of condensed moisture making it readily visible. In addition to its use for power generation, steam is employed extensively for heating purposes as well as in important reactions in industrial chemistry.

Steam may be generated by the application of heat to water or aqueous solutions. If a quantity of water confined by some pressure P is heated, the absorption of heat increases the pressure p exerted by the water vapor against its surroundings. When the vapor pressure p becomes equal to the confining pressure P the water boils (liquid changes to gas) without an increase in temperature. The steam formed occupies a much larger volume than the same weight of liquid, and when all of the latter is vaporized, the volume occupied by the steam depends on the temperature and confining pressure.

Energy transfers in the generation of steam are very important. They may be summarized thus:

The heat necessary to raise the temperature of the liquid to its boiling point (100° C. under atmospheric pressure) is called the "heat of the liquid." At its boiling point the liquid vaporizes without increase in temperature, and one gram of liquid requires 539 calories of heat to convert it into steam at the same temperature. This is called the latent heat of vaporization and is greater for water than for other liquids. It is believed to consist of two parts: the heat necessary to overcome the force of attraction between the molecules, called the inner latent heat; and the heat necessary to effect the increase in volume, called the outer latent heat. The steam, after removal from contact with the water used to generate it, may be heated to higher temperatures and is thus called *superheated steam.* The sum of all the heats absorbed is called the "total heat" of the steam. Since the efficiency of a steam engine depends upon the temperature of the steam that it employs, the superheating of steam is very important in power generation. If saturated steam is confined, as in a boiler, its temperature as well as pressure may be increased by application of heat. The steam temperature in general use in the U.S. is 850° F.

From a chemical standpoint steam is not very reactive. One very important reaction, however, is the oxidation of red-hot coke by steam to form water gas, a mixture of carbon monoxide (CO) and hydrogen (H_2). This gaseous mixture may be slightly enriched with hydrocarbons to form a very important fuel.

Steamboat (*stēm'bōt*) or STEAMSHIP. See *Ship; Speed Records.*

Steam Engine (*stēm ĕn'jĭn*), any device which uses the heat energy stored up in steam for the production of mechanical work. The steam engine was one of the most important inventions of the 18th century; it completely revolutionized the process of manufacture and radically changed the social life of the peoples of the world.

Usually, the term steam engine is applied only to the reciprocating type, *i.e.,* an engine in which steam pushes a piston back and forth in a cylinder. When the steam is admitted, alternately, to both sides of the piston, the engine is called a double-acting engine; when the steam acts only against one face of the piston, it is called single-acting. The distinguishing characteristic of a steam engine is that the heat energy to produce the steam which causes the to-and-fro motion of the piston is added not in the cylinder of the engine, but in an external vessel called the boiler. In the gasoline or oil engine, the heat energy to cause this reciprocating motion is produced in the cylinder itself by the explosion of the fuel. The steam engine is therefore known as an *external-combustion* engine as contrasted to the gas and oil *internal-combustion* engine (*q.v.*).

The figure shows a modern, double-acting, Unaflow (a type of uniflow) steam engine. A round piston P with flat ends moves freely within a smoothbore cylinder C. The piston is attached through a series of linkages to the crankshaft as shown. The reciprocating motion of the piston is thereby converted into rotary motion of the driving-shaft and flywheel.

Steam to drive the piston is supplied to the engine from a steam boiler. It enters the cylinder alternately through intake valves V_1 and V_2 which open and close at the proper instant to produce the desired reciprocating motion of the piston. After expansion on either side of the piston, the steam is released through an exhaust port E uncovered by the piston itself and from there flows into the exhaust outlet O. In addition to the two intake valves there are two auxiliary exhaust valves V_3 and V_4.

To illustrate the operation of the engine, assume that the piston at a given instant is as far to the right as it can move. At this instant the intake valve V_2 opens admitting steam to the right side of the piston, driving it back toward the left. After the piston has moved a short distance leftward, the valve V_2 closes, leaving the piston to continue its movement under the force of the expanding steam. When the piston nears its farthest left-hand position it uncovers the exhaust port E, permitting the spent steam in the right-hand side of the cylinder to flow into the exhaust outlet O. At this instant valve V_1 opens, admitting steam to the left side of the piston and forcing it back toward the right. As it moves rightward the auxiliary valve V_4 opens, allowing still more of the spent low pressure steam to escape to the exhaust. Upon approaching the farthest right-hand position the exhaust port E is uncovered by the piston, releasing to the exhaust the expanded steam on the left-hand side of the piston. At this instant valve V_2 opens again starting a renewed sequence of events. The speed of the engine is controlled by automatically adjusting the amount of steam fed to the cylinder.

A steam engine may vary in size, from a small child's toy which can be held in the hand to a monstrous compound engine with cylinders having a diameter of 9 ft. each. It may operate with steam pressure as high as 400 lb. per sq. in., and the flywheel may revolve as fast as 300 r.p.m.

Although the steam engine has been almost completely replaced by the diesel engine and the steam turbine for the production of electric power, it is still sometimes employed for dredging lakes and harbors, pumping water from mines, pulling freight, and moving marine vessels. The large space required for the furnaces, boiler, condenser, and piping have placed it at a great disadvantage when compared with other types of engines.

History. The first practical steam engine was invented by Thomas Savery in 1698. Before this time several people had conceived steam engines and a few toys had been built, but no one before had tried to harness a steam engine to do work.

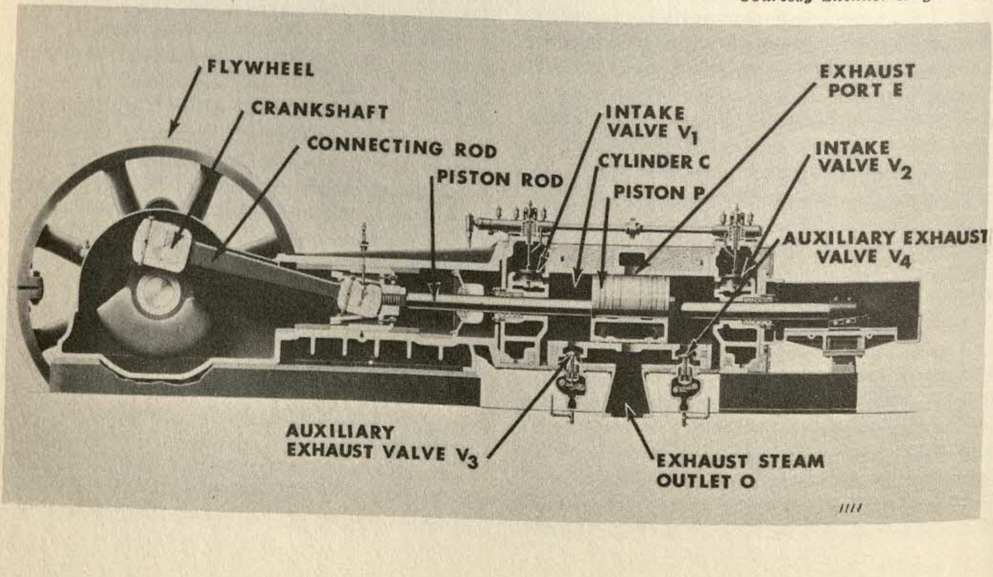
In 150 B.C. Hero of Alexandria had constructed a kind of rotary steam engine called the "aeolipile" or ball of Aeolus (god of the winds), but this was actually an ancestor of the modern steam turbine rather than of the reciprocating steam engine. In 1629 Giovanni Branca, an Italian, caused a wheel to turn by means of a jet of steam striking blades set into its rim. In 1690 Denis Papin outlined plans for a reciprocating steam engine using a piston and cylinder. This steam engine was probably never built; Papin is, however, credited with the invention of the safety valve.

Thomas Savery's engine was used for pumping

FIGURE I

This cross section of a double-acting Unaflow steam engine is further explained in the text

Courtesy Skinner Engine Co.



water from the coal mines. The force of the steam acted directly upon the surface of the water, which resulted in a great loss of power from condensation of the steam when contact was made with the cold water. It remained for Thomas Newcomen, a blacksmith of Dartmouth, England, to design and build a steam engine with a piston. Steam was admitted to a cylinder, where it pushed the piston upward to the top of its stroke. A jet of cold water was then applied to the sides of the cylinder to condense the steam. This caused a partial vacuum in the cylinder under the piston and allowed the atmospheric pressure to push the piston back to make its working stroke. The piston was connected to one side of an overhead rocking beam, the other side of which was connected to the piston of the pump cylinder. Although the Newcomen engine eliminated much power loss by preventing the direct contact of the hot steam with the cold water, considerable energy was still lost when the hot steam entered the cylinder after it had been cooled far below the steam temperature. In 1769, James Watt (*q.v.*) patented a steam engine which eliminated this feature. He also developed other features which are the bases of today's steam engines. These include the separate condenser (so that the cylinder can be kept hot to avoid loss through condensation), the expansion of the steam to push the piston (by installing a valve to cut the steam off after the piston has moved a certain distance—"cut-off"), and the conversion of reciprocating motion into rotary motion. Before these improvements by Watt, the use of steam engines was almost entirely confined to raising water; but with Watt's invention they could be used in other industrial fields.

The next major inventions were the George H. Corliss (1817-88) valves and valve gear. They insure a quick closing of the steam intake which reduces frictional flow during closure of the valves. A more recent development is the Johannes Stumpf uniflow engine, which is designed to reduce further the loss from steam condensation.

The steam engine was both a product and a cause of the so-called Industrial Revolution (*q.v.*). Before its application to industrial uses, factories and mills had necessarily been located only near waterfalls which could provide their power, regardless of the nearness of raw materials or markets. The steam engine provided power at any location; and later still it provided both land and water transport for both raw materials and finished goods. Because engines and the machines they powered were too costly for individual workers to own, they fostered the growth of concentrations of capital and of industrial cities. Large congregations of machine-tending workers in turn produced the need for organization. Thus modern capital structures, labor unions, marketing policies, and, to a large extent, political policies may be said to stem directly from the perfection of the steam engine. See also *Electric Railway; Railroads; Ship; Steam Turbine.*

Steam Hammer (*stēm hăm'ẽr*), a powerful forging tool invented by James Nasmyth, a Scottish engineer, in 1839. Nasmyth's purpose was to design a machine capable of forging the paddle-wheel shaft for the steamer *Great Britain,* then under construction. In 1842 he discovered a variant of his device, apparently pirated from his early notes, in use in French foundries.

The steam hammer operates on the pile-driver principle, the hammer being raised to the required height by steam and then released by a cut-off mechanism. There are three principal types of steam hammer, the single-arm with guides; the arch, also with guides; and the Rigby, which has a longer stroke and provides the smith more room to maneuver his work on the anvil. In weight of falling parts, hammers range from 50 lb. to over 12 tons. They are usually hand-lever or treadle controlled, but may be equipped with a valve-gear to make them automatic. Many special types of hammer framings and anvils have been built for specific operations. In some hammers steam is used only to raise the moving parts, while in others it adds to the downward impetus also. In some very large hammers, hydraulic or compressed air systems replace steam.

Steam Roller (*stēm rōl'ẽr*), a self-propelled machine used for compacting the sub-base or surface of roads. It resembles a wagon in which heavy rollers replace the wheels. There are two main types, the macadam and the tandem. The macadam has two wheels mounted on a common axle and a third for steering. The tandem has two wheels or rolls, one being divided into three or four parts to facilitate steering; it is used primarily on roads of the asphalt type to obtain a finished surface. Most steam rollers are equipped with vertical firetube boilers and two high-pressure cylinders connected to cranks at an angle of 90°. Some are also fitted with scrapers operated by compressed air, for breaking up or loosening road surfaces. Rollers vary in weight from 5 to upwards of 20 tons. Many so-called steam rollers are now powered by internal-combustion engines.

Steam Shovel (*stēm shŭv''l*), a machine for excavation on dry land, in some ways resembling the steam dredge. It came into general use about 1865 and is employed in railway, canal, and building construction, and in certain types of mining. It consists essentially of a bucket with a tined lower leading edge and a hinged bottom, mounted on a self-propelled jib crane. The bucket is thrust through the cut, raised when full, and swung aside for discharge into cars or trucks. Parts of the crane subject to the heaviest wear are ordinarily made of manganese or similar alloy steels. The capacity of the machine is indicated by the size of the bucket in cubic yards, ranging from ½ to 15. The cab and driving mechanism are mounted on railroad rails or caterpillar treads. Although still called steam shovels, many of these machines have gasoline, diesel, or diesel-electric power, the last-named giving more satisfactory power regulation than direct diesel drive. By way of example, a 15-cu.-yd. shovel used in mining weighs 1,400 tons and is mounted on 8 "caterpillars" with hydraulic compensators to enable it to adjust to uneven ground. The three main operations, cutting, lifting, and rotation, are controlled by separate electric motors.

The dragline excavator used in drainage or foundation work, draws a bucket toward the machine. In the skimmer scoop, the bucket is drawn horizontally, in a path determined by the radius of the crane. It is used for de-surfacing roads. Still another variant uses a series of scoops on an endless chain, digging a continuous channel for drainage pipelines or underground cable installation. A number are employed in the Lake Superior region for open-pit mining, loading ore on cars for transportation to the smelter.

Steam Turbine (*stēm tûr′bĭn*), a device which converts the heat energy of high-temperature high-pressure steam into rotational mechanical shaft work. The distinguishing characteristic of a turbine is its rotary power unit, in place of the reciprocating type found in most other engines (see *Steam Engine*).

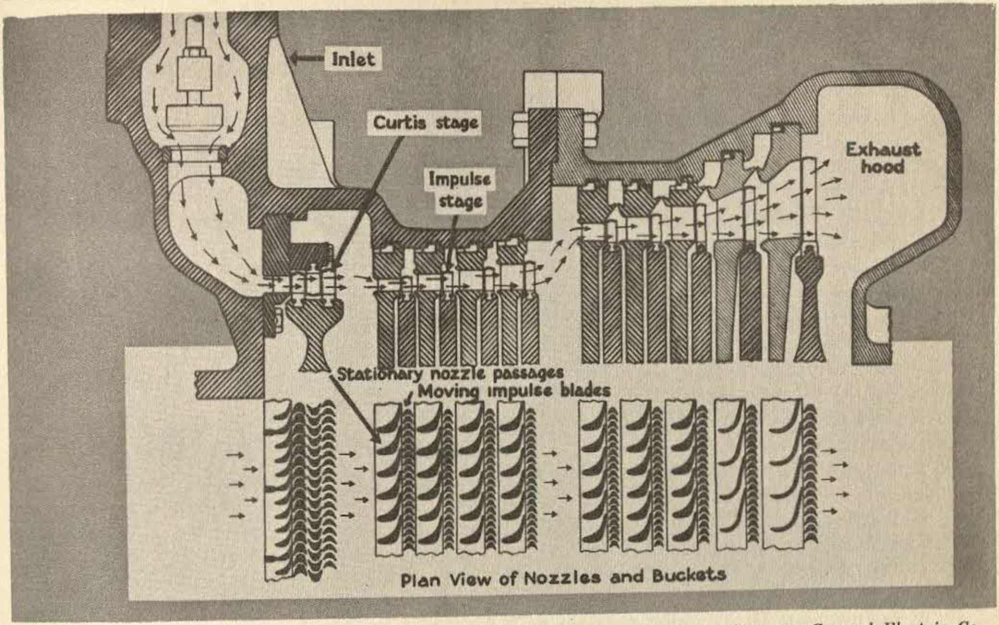
The essential elements of a steam turbine are a series of nozzles, a rotor (consisting of a horizontal shaft to which curved, shaped blades are attached), and a housing or casing to support and enclose the rotor. The nozzles consist of directed passages through which the incoming steam flows to a region of lower pressure, the purpose being to convert some of the heat energy of the slow-moving steam into kinetic energy of a high-speed jet. The rotor consists of one or more rotating wheels or drums having a large number of curved blades set into their rims. These blades are arranged and designed so that the fast-moving steam from the nozzles, upon striking or passing between them, will cause a force on the blades and turn the rotor.

There are two basic types of steam turbines, the *impulse* and the *reaction* types. The De Laval single-stage impulse turbine, invented by the Swedish engineer, Carl Gustaf de Laval (1845-1913) consists of a single wheel bearing one row of cup-shaped blades. The high-speed jets of steam coming from several nozzles strike directly against these blades and force the rotor to turn. This type works, in principle, somewhat like a windmill or water wheel. The Curtis turbine is similar to the De Laval turbine except that it has two rows of moving blades separated by a row of stationary blades, the stationary ones being attached to the inside of the casing. The stationary blades act as guide vanes for the steam flowing from the first row of moving blades to the second. Other types of impulse turbines are the re-entry turbine and the Rateau or pressure staged turbine. The former consists of an arrangement whereby the steam jet leaving the nozzles is directed successively through the same row of moving blades more than once. The Rateau or pressure staged turbine consists of a series of stages following one another, each stage consisting of a single row of nozzles and a single row of moving impulse blades. The distinguishing characteristic of the impulse-type turbine is that pressure drop, and resulting expansion of the steam, takes place only in the stationary nozzle passages and not in the moving blades.

Unlike the impulse turbine, the reaction turbine contains moving blades attached to the rotor which are shaped to form nozzle passages similar to those employed for the stationary nozzles. In passing through these reaction blades the steam is accelerated, causing a "kickback" or "reaction" which may be comparable to the backward push on a fire hose caused by the sudden acceleration of the water through the nozzle. Both the stationary and moving blades of a reaction turbine are shaped much like an airplane wing. In some of the larger turbines there may be as many as fifty stages spaced successively along the drum of the rotor, each of which consists of one row of stationary nozzles and one row of moving reaction blades. Since a pressure drop occurs as the steam flows through the blading, it is necessary that their size increase along the length of the drum to accommodate the increased volume of the steam.

Because different types of turbine stages operate best under different steam conditions, it is not unusual to use combinations. For example, in most large turbines where the inlet steam pressure is high and the exhaust pressure is low the first stage may be a Curtis stage, followed by a series of either impulse or reaction stages.

The flow pattern of a typical impulse steam turbine is shown in Fig. 1. The upper portion of the figure is a cross-sectional view, showing how the turbine would look if cut in half longitudinally and vertically along the center of the rotor. The first Curtis stage with two rows of moving blades attached to the rotor and one row of nozzles and stationary blades attached to the casing is clearly shown. The remaining stages are Rateau or pressure stages. Each consists of a row of nozzles attached to the casing and a row of moving blades attached to the rotor. The lower portion



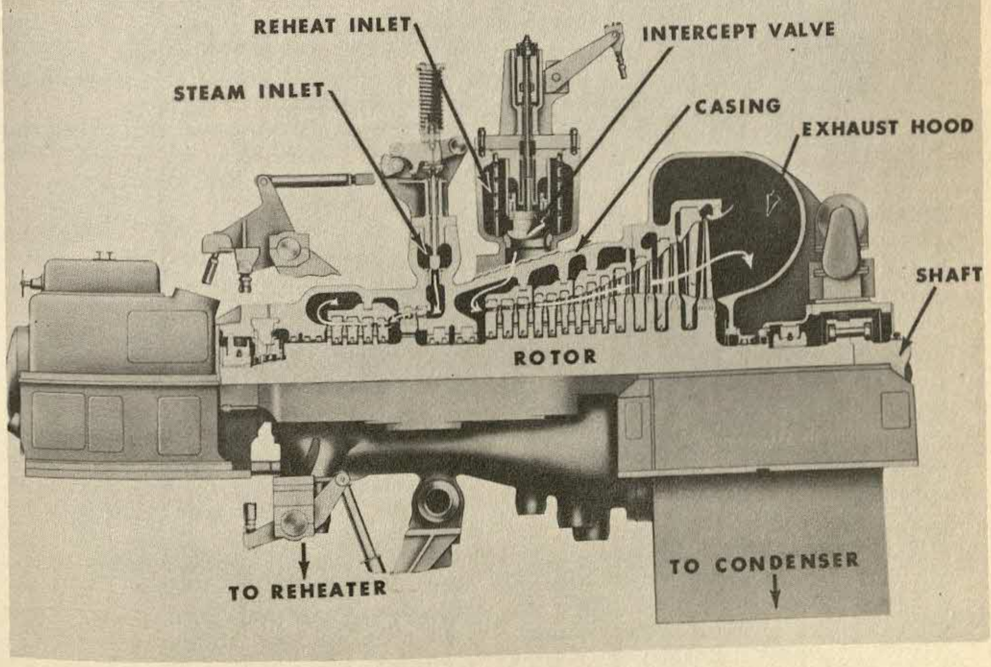
Courtesy General Electric Co.

FIGURE I

Above is a cross-sectional view of a ten-stage impulse turbine, showing flow path and nozzle and blade shapes

FIGURE II

Below is a cross-sectional view of a 3,600-r.p.m., tandem-compound, single-flow, reheat steam turbine, rated 40,000 to 75,000 kw.



of the diagram illustrates the shape of the nozzles and blading if viewed in cross section looking down on the end of the blades.

A typical steam turbine of the type employed for the generation of electric power is shown in Fig. 2. In this turbine, steam under a pressure of 1,450 lb. per sq. in. and a temperature of 1,000° F. enters the turbine through the steam inlet valve. From there it flows toward the left through the first Curtis stage and continues on through four pressure stages, after which it is withdrawn and taken back to the boiler for reheat to 1000° F. Next it is admitted through the intercept valve to the low pressure portion of the turbine. From here it flows through 13 pressure stages to the exhaust. In a condenser (*not shown*) it is liquefied and pumped back into the boiler to be remade into steam.

The steam turbine is well suited for the production of enormous quantities of power. For this reason it is widely used for the propulsion of ships and for the production of electric power. About three-fourths of the electric power produced in the U.S. is obtained from generators connected to steam turbines. In the larger central-station electric-generating plants, the steam may enter the turbine at pressure as high as 2,500 lb. per sq. in. and at temperatures as high as 1,100° F. These turbines are capable of generating as high as 250,000 kw. or about 335,000 h.p. They rotate at either 1,800 or 3,600 r.p.m. Contrasted with the reciprocating steam engine, the steam turbine will produce much more power for the same floor space. Furthermore, for the same power output the turbine is less expensive, simpler to operate, and more efficient.

The development of the steam turbine has been one of the main contributing factors to our modern way of life, since it has made possible the generation of tremendous quantities of electrical energy at low cost. Coupled with other developments the average amount of fuel required to produce one kilowatt hour of electrical energy in a modern steam turbine power plant has been reduced from about 2 lb. in 1927 to 1 lb. in 1954. The outlook is that this will gradually be reduced even further in the future.

Steam Whistle (*stēm hwĭs′'l*) or SIREN, an apparatus for producing a loud whistling sound through the agency of steam. It is attached to a steam boiler, as in a locomotive, and the sound is produced by a rapid discharge of the steam, which issues from a narrow ringlike orifice around the upper edge of a cup or hemisphere, then striking the thin edge of a bell above it. The sound is produced in the same way as in a common whistle or an organ pipe. The steam is shut off by a stopcock, to which a cord or wire is attached for the purpose of opening the stopcock and thus permitting the steam to rush through the opening when a signal is to be given. An instrument known as the *calliope* has a number of steam whistles suitable to produce musical tones, the length of the pipe or cup giving variations to the sound produced. Modern electric and diesel locomotives use whistles similar in construction but operated by compressed air rather than by steam.

Stearic Acid (*stē-ăr′ĭk ăs′ĭd*), a product obtained from mutton suet and other fats that contain stearin. It is odorless and tasteless, combines with numerous bases, and with the latter forms acid and neutral salts called *stearates.* It is insoluble in water, but is soluble in alcohol. In fats it exists in combination with glycerin. It is used in making candles.

Stearin (*stē′ạ-rĭn*), the glycerol ester or triglyceride of stearic acid. With olein and palmitin, stearin is found in animal fats or in oils such as palm oil. It is soluble in most organic solvents and may be crystallized from an ether-alcohol solution. Its formula is $(C_{17}H_{35}COO)_3C_3H_5$.

The stearin, or stearine, of commerce is a mixture of stearic and palmitic acids, obtained by the hydrolysis of fats. Oleic acid (melting point, 14° C.) is then removed in a hydraulic press. Stearin is used in stearin candles and as an additive in paraffin candles to make them more opaque and less subject to heat-softening.

Steatite (*stē′ạ-tīt*). See *Soapstone*.

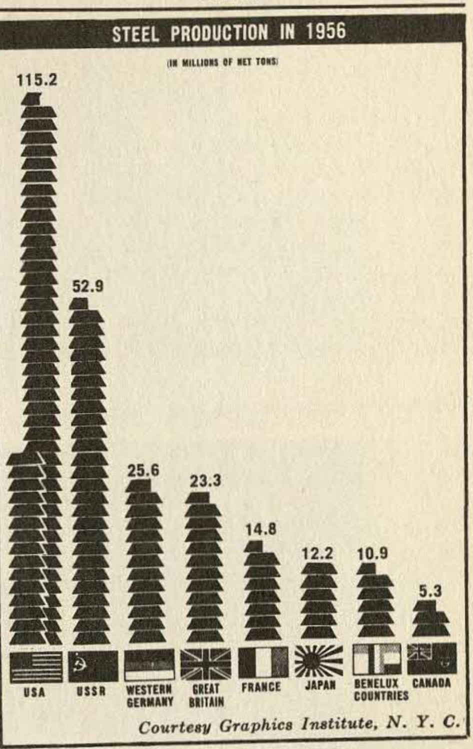
Steatopygia (*stē-ȧ-tō-pī′jĭ-ȧ*), anthropological term referring to excessive fatness of the buttocks, a characteristic feature among Hottentot and Bushman women. Whether or not this is due to a special gene confined to these peoples, or due to the overactivity of a gene also found among white females is not known.

Stedman (*stĕd′mạn*), EDMUND CLARENCE, poet, critic, and banker, born in Hartford, Conn., Oct. 8, 1833; died in New York City, Jan. 18, 1908. He entered Yale Univ. in 1849, but left in his junior year and worked (1852-61) on several Connecticut and New York newspapers. During the Civil War he was a field correspondent (1861-63) for the New York *World.* After the war he became a successful stockbroker and was a member (1869-1900) of the New York Stock Exchange. His first volume of poetry, "Poems Lyric and Idyllic," was published in 1860. Subsequent volumes included "Alice of Monmouth, and Other Poems" (1864), "Hawthorne, and Other Poems" (1877), and "Lyrics and Idylls" (1879). His major critical works are "Victorian Poets" (1875), "Edgar Allan Poe" (1880), and "Poets of America" (1885). He also edited three excellent anthologies, "A Library of American Literature" (with Ellen Mackay Hutchinson, 11 vols., 1888-90), "A Victorian Anthology" (1895), and "An American Anthology" (1900). Stedman was president of the

National Inst. of Arts and Letters (1904-05). His "History of the New York Stock Exchange" appeared in 1905, and a posthumous volume of "Poems" in 1908.

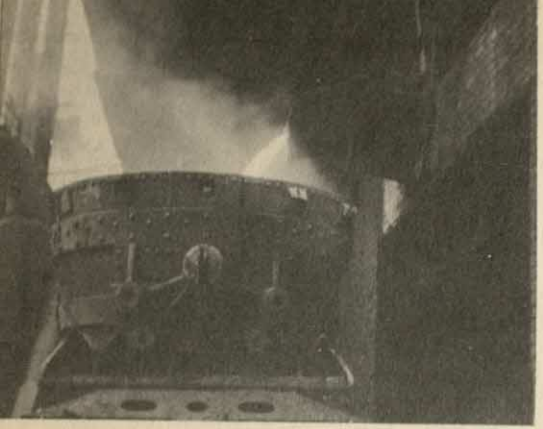
Steel (*stēl*), an alloy of iron and carbon which is malleable as cast and can be produced in different degrees of hardness, depending upon heat treatment and cold working. Primitive man sought malleability in the metals he made by melting down stones and earth. His need was to shape metal by hammering it without breaking it, to deform it without disintegrating it. Much later, he discovered he could reassemble fragments of it, melt them, and reuse the metal. Still later on, he found he could cast melted metals into shapes he desired. The ancients, therefore, prized six metals of varying malleability, namely, gold, silver, copper, lead, tin, and iron. Gradually, it was discovered some of these metals possessed strength and hardness as well as malleability, and primitive man gave way to the artisan, to whom the strength of a metal became its most valued characteristic. It is this quality which makes iron, in the form of steel, the paramount metal of today. The date steel was first made cannot be definitely known because the transition from wrought iron was gradual—at first by accident, as a consequence of subjecting ordinary iron to carburization. We do know, however, that a metal called "steel" was made centuries ago by a process called cementation, in which carbon was worked into iron for making sword blades. As early as Chaucer's time (1340-1400), Sheffield, England, was famous for its manufacture of "steel" knives. In the method of fabrication used there, bars of imported iron were placed in contact with granulated charcoal and exposed to intense heat in a stone box for a week until the iron absorbed carbon from the charcoal, emerging from the crude crucible as "blister" steel.

The modern *Steel Age* actually began when William Kelly succeeded some time after 1851 in producing a soft, malleable steel by blowing air through a molten mass of iron in Eddyville, Ky. At almost the same time and by a similar process Henry (later Sir Henry) Bessemer, made the first trial heat of pneumatic steel in England. Results of these discoveries were immediate in the U.S. In 1864 the first ingot of this type of steel was made in the U.S. on a commercial scale by William F. Durfee, acting for the Kelly Pneumatic Process Co., at Wyandotte, Mich. The first rail made in the U.S. from the new steel was rolled at the North Chicago Rolling Mill in 1865. The first commercially successful open-hearth steelmaking operations were performed during 1879-80 in a 5-ton furnace designed by Samuel T. Wellman and built at the Bay State Iron Works, South Boston, Mass. Dr. Paul Heroult received a patent for an electric furnace in 1886.



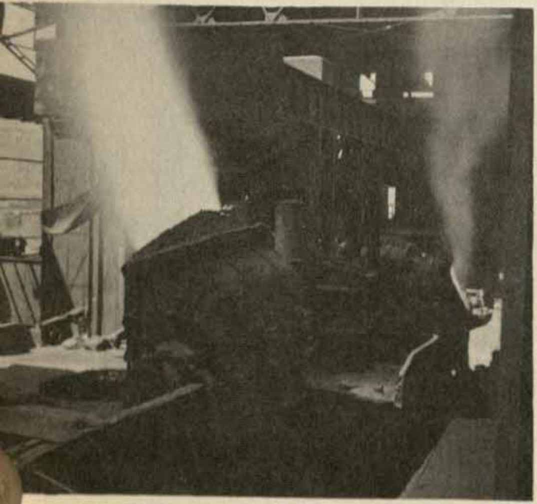
Courtesy Graphics Institute, N. Y. C.

The modern manufacture of steel begins with the mining of three essential raw materials—iron ore, coal and limestone, with measured quantities of various chemical elements added later to make alloy steels (see *Iron; Metallurgy; Metals and Alloys*). To make all steel from iron ore exclusively would be both costly and wasteful of a valuable natural resource. Since it takes nearly two tons of iron ore to produce a ton of pig iron—an intermediate step in the manufacture of steel—large savings can be effected by substituting for part of the pig iron a certain proportion of iron and steel scrap, which can be salvaged from worn or outdated cars, ships, automobiles, rails, various kinds of machinery. Chips and shavings from machined steel also yield quantities of scrap, in addition to that produced in the steel mills themselves, in the course of rolling and forming processes. Usually, to even up the cost, steel is made of a mixture of scrap and pig iron, one proportion being 55 per cent scrap and 45 per cent pig iron. Next to iron ore, the most important raw material required for the manufacture of steel is coke. This is made from special grades of soft coal found in western Pennsylvania, Kentucky, West Virginia, southern Ohio, Oklahoma, Utah, and Arkansas. "Coking coal" is subjected to intense heat to drive out gaseous substances, resulting in a coke, used in blast furnaces,



Courtesy American Iron & Steel Inst., N. Y.

MOLTEN PIG IRON LEAVING THE BLAST FURNACE



Courtesy American Iron & Steel Inst., N. Y.

BESSEMER CONVERTER IN FULL BLAST

which is composed of almost 90 per cent carbon, not quite 10 per cent ash, and minute quantities of sulfur and phosphorus (see also *Coal; Coke*). The manufacture of steel from pig iron and scrap, like the making of pig iron from ore, is a refining process in which impurities are removed to produce a relatively pure product. The chemical assistance required to eliminate the impurities in the blast furnace is provided by *fluxes,* materials which render the impurities fusible at operating temperatures, combine with them, and carry them off as slag from the surface of the molten iron. Fluxes are also used in steelmaking to assist in the removal of unwanted elements. Limestone, the most important of these fluxes, is used in two of the operations—once in the manufacture of pig iron in the blast furnace, and again when the iron and scrap are converted into steel. This third raw material for making steel is found in many localities. Since it lies near the surface, it is frequently quarried by blasting, after which it is crushed and screened to size.

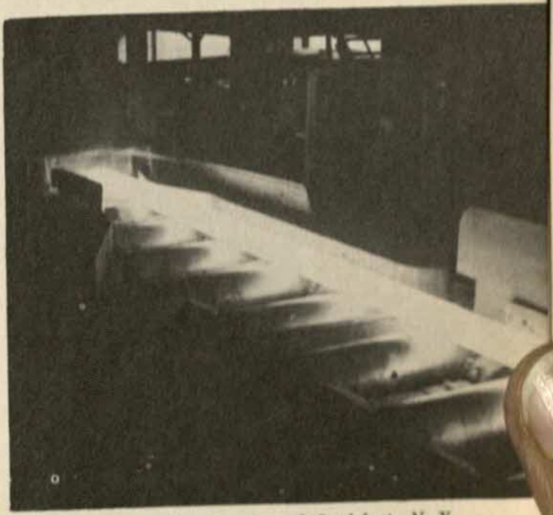
The first step in the manufacture of steel is actually the preliminary process of making the pig iron from which steel is derived (see *Iron*). At the final stage in the smelting of iron ore in blast furnaces, the iron flows in a white-hot steam down a runner into "ladles" which are mounted on trucks, hauled to the steel mill, and stored in a huge container called a "mixer," to be kept hot until needed. The steel itself may be made in an *open-hearth furnace*—the most prevalent of modern methods —or in a *Bessemer converter,* or in an *electric furnace.* Since more than 90 per cent of the nation's steel is produced in the *open hearth,* this method should be considered first. The *open-hearth* furnace is a rectangular, completely enclosed brick structure, not unlike a kitchen broiler in basic design and operation, but built to operate at 3,000° F. instead of 550° F. The name is given because the "hearth" of the furnace is exposed to the sweep of flames, which melt and refine the metal. Natural or artificial gas, oil or tar, or two or more of these in combination, are the fuels commonly used. Together with preheated air, they are blown into the furnace through large openings, or "ports," located at either end, and the flow is reversed at 15-minute intervals throughout the process. Beneath the furnace proper are two large chambers containing a checkerboard arrangement of firebrick, through which air or gas flows freely. As the hot products of combustion pass out through one of the ports, and through the checkerwork, they heat the bricks. At the same time the air entering through the other side of the furnace is being heated in the corresponding checker chamber, which was previously heated in the same manner. Thus the open-hearth furnace is in effect built on stilts, to provide room for checker chambers underneath and, at the same time, sufficient elevation so that the molten steel may be drawn off by gravity into a "ladle."

The capacity of open-hearth furnaces varies from 22 to 600 tons per "heat" or batch. The furnace is first charged with limestone. Next, iron oxide may be added in the form of rich lump ore. Then, if scrap is to be used, huge bundles of it are dumped into the furnace. At this point the scrap must be melted. In the meantime, liquid iron is brought from the mixer and poured in through portable funnels or troughs. Under the intense heat, the undesired excesses of minor constituents are oxidized by the ore and gases, and the limestone begins to work, uniting with impurities in the metal to form a slag which floats on the molten mass. Usually from 9 to 12 hours are required to produce a "heat" or "melt." During the first half of the period, the raw material is charged and melted. The remaining time is needed to refine the metal. At frequent intervals, samples are sent to the laboratory for analysis. When the last hour of the heat, the most important period of the whole process, arrives, the melter—who has had years of experience in steelmaking—peers through a peephole in the furnace, his eyes shielded by dark goggles, until he is satisfied that the metal is ready, judged by the color of the flame and other evidences from his experience, as well as by the analyses from the laboratory. The furnace is then tapped by knocking out a plug at the rear, allowing the molten metal to flow into the large ladle. The slag, much lighter than steel and floating on the top, overflows into a smaller ladle called a "thimble." While the steel is still white-hot in the ladle, necessary quantities of other ingredients are added as required. Naturally, requirements vary with each order. Steel for rails differs vastly from that used to build the modern streamlined trains which will glide over them.

In point of tonnage, the *Bessemer process* is third most important in steelmaking. When air is blown through molten iron, the oxygen combines with the carbon, manganese, and silicon. Intense heat is generated by this reaction, and the iron is freed from most of its impurities and thus converted into steel. The Bessemer converter is a pear-shaped, tilting vessel, built of steel plates and lined with heat-resisting bricks and clay, usually holding from 11 to 28 tons of metal; the top is cut off to form a mouth through which molten metal is charged and discharged, and the vessel has a double bottom, the lower portion of which is an air chamber. Air is blown into this chamber, and through perforated holes into the molten metal in the vessel. Unlike the open hearth, which may be charged partly with scrap, the Bessemer converter uses only molten iron. To charge the vessel it is tilted backward to a horizontal position and the metal is poured into the mouth. Air is blown through the double bottom as the vessel returns slowly to a vertical position. The inrush of air, which in a 15-ton converter arrives at a pressure of 15 to 20 lb. per sq. in., 20,000 cu. ft. a minute, prevents the molten metal from escaping through the holes in the bottom. No heat is required from outside sources, since the chemical reaction resulting from the blast provides all that is necessary. In operation, the converter presents a magnificent spectacle. Brilliant sparks burst forth, followed by dense brown fumes and dark red flames—colors which have an important meaning for the Bessemer melter since they indicate that the silicon and manganese of the iron are being burned out. After a few minutes, as the carbon burns out, the flame becomes longer and more luminous, then dies down completely after all the impurities have been eliminated, which takes about 15 minutes more. Following the blast, the converter is tilted backward again and the air shut off. The necessary elements are added to bring the steel up to specified composition, and when the steel is ready the converter is tilted still farther to allow the liquid metal to run out. The Bessemer process is the most direct and rapid in the manufacture of steel. A modern Bessemer plant with adequate facilities for charging the converter and removing the product can produce as much as 100 tons of steel an hour from each 25-ton vessel. It would take at least two modern blast furnaces, together producing 2,000 tons of iron a day, to keep a single 25-ton converter operating 24 hours. Since, however, only high-grade, low-phosphorus ore can be used advantageously in the acid Bessemer process, only 2.8 per cent of all steel made in the U.S. in 1956 was produced in this way.

Courtesy American Iron & Steel Inst., N. Y.

FILLING INGOT MOLDS WITH STEEL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ROLLING A STEEL BAR

Although about 92 per cent in quantity of the steel made in the U.S. during 1956 came from the open-hearth furnace or the Bessemer converter, steels of certain special compositions and high quality are generally produced in the *electric furnace,* the second-largest producer in tonnage, which provides a maximum of control over the reactions that take place. Thus stainless steels, and tool and special alloy steels, are nearly always electric furnace steels. There are frequently combinations of the various steelmaking processes. Sometimes steel made in a Bessemer converter is "duplexed" in the open hearth. Quite frequently, too, steel made in a Bessemer converter or an open-hearth furnace may be still further refined in the electric furnace. In this field, the arc furnace is used almost exclusively, with electric current, which is the source of all heat in this process, very rapidly generating temperatures as high as 3,500° F. Temperatures at all times are under precise control. Moreover, electric heat eliminates the need for oxygen to support combustion, thereby rendering atmospheres within the electric furnace controllable at will. The body of the furnace is a circular steel shell with a spout, mounted on rockers so that it can be tilted to pour off its molten metal and slag. Through the thick refractory dome, great columns of carbon extend into the furnace—the electrodes, which carry the current to the charge. The flow of current is regulated by raising and lowering these electrodes, which are commonly 17 in. or more in diameter and about 6 ft. or more long, spaced far enough apart so that no arc can occur from one to another. During the melt, they project to within an inch of the layer of molten slag which floats on top of the steel, the current jumping the gap between the electrode and the slag, passing from the slag into the metal, through the metal and up to the foot of the next electrode. Because the metal immediately beneath the electrodes is hotter than that near the walls of the furnace, the molten metal is in constant agitation, as if it were boiling, and so is thoroughly mixed and uniformly heated. After the charge is melted, carefully adjusted amounts of alloying elements and other elements are added to give the steel its desired composition. These elements, such as nickel and chromium, may be added either in the form of pure metal or as metallic combinations with iron (see *Metallurgy*). When the heat is completed, the furnace is tilted so that the steel runs out the spout into the ladle. If the charge consists of molten metal, a heat of 25 tons of electric furnace steel can be produced in about 4 hours. If cold scrap is charged, 6 hours are required. About 8 per cent of the nation's steel was produced in 1956 by the electric furnace method.

After molten steel leaves the furnace—whether it be an open hearth, a Bessemer converter, or an electric furnace—it is "teemed" or drawn from large ladles into "ingot molds" where it solidifies. Ingots may be of many sizes and shapes, usually large rectangular blocks weighing approximately 5 to 10 tons. As soon as the steel in the ingots has solidified sufficiently, the molds are stripped off by powerful machines, and this stripping of the ingot marks the completion of the actual process of making steel. However, these ingots must be "soaked" in a special pit furnace to bring them to a uniform temperature throughout before they can be rolled in the steel mills. Here the customer's order determines the process—whether the ingots will be rolled into "blooms," or slabs, or other shapes, on through many types of rolling mills or forming operations by which they are made into such products as sheets, or shapes, or rails, or tubes, or wire.

Recent developments in the science of steelmaking include the turbo-hearth process which can produce a high-quality steel in as little as 12 minutes. The turbo-hearth is shaped like a giant coffee maker into which molten pig iron is poured. Blasts of air are blown over the molten iron, rapidly burning out the carbon and other impurities. A machine has also been developed for the continuous casting of steel in a few cross sections, reducing the high operating cost and massive machinery formerly needed for this process.

Before the war more than a billion tons of steel was in use in the U.S., which meant more than 17,500 lb. for every man, woman, and child in the country. Steel production capacity has continued to increase, and on Jan. 1, 1957, was 133,459,150 net tons. See also *Damascus Steel; Metals and Alloys; Tempering.*

Steel, STAINLESS, a kind of steel which contains high percentages of chromium and nickel and so resists rust and corrosion indefinitely. In 1930 it came into extensive use in the manufacture of cutlery, household utensils, automobile trimming, hospital equipment, etc.

Steele, SIR JOHN, sculptor, born in Aberdeen, Scotland, Sept. 18, 1804; died in Edinburgh, Sept. 15, 1891. He studied at Edinburgh and later at Rome. Steele won a prize for the seated statue of Sir Walter Scott, in Edinburgh. Two of his statues are in New York City, one of Robert Burns and one of Sir Walter Scott.

Steele (*stēl*), SIR RICHARD, essayist and playwright, born in Dublin, Ireland, in 1672; died in Carmarthen, Wales, Sept. 1, 1729. Steele, the son of a Dublin lawyer, first attended school in Dublin but afterward studied at Charterhouse and at Oxford. It was at Charterhouse that he met Joseph Addison and formed a friendship that was continued at Oxford and led to their later extensive literary collaboration.

Steele left Oxford without taking a degree and enlisted in the army in 1694. From enlistment as a "gentleman trooper" he rose to the rank of captain, not, perhaps, because of his military achievements but rather because his literary efforts brought him to the attention of influential men.

Steele's first important work was "The Christian Hero," published in 1701, a work in which he insisted that Christian principles are necessary to a soldier and essential to any greatness. It was in 1701 also that he wrote his first comedy, "The Funeral." Since Steele was not himself strictly conventional in his conduct—especially in his fondness for wine—"The Christian Hero" subjected him to some raillery among his companions. There can be no question of his sincerity, however, for the greater part of his life work was devoted to the attempt to reform the manners and morals of his countrymen by means of good-natured ridicule. There is ample evidence that the excesses into which he was led by the ebullience of his own nature resulted in frequent and serious conflicts of conscience.

Steele is best known for his *Tatler,* a news and literary paper published three times a week from Apr. 12, 1709, until Jan. 2, 1711, and for *The Spectator,* a literary journal published daily from Mar. 1, 1711, until Dec. 6, 1712. *The Spectator* he undertook in collaboration with Addison, who had made frequent contributions to *The Tatler* but who had not shared responsibility for it.

In *The Tatler* and especially in *The Spectator,* Addison and Steele made an extremely important contribution to literature by establishing the familiar essay as a literary form and by adapting it to the uses of journalism. They anticipated the development of the short story by their invention of Sir Roger de Coverley and his circle of friends and by their anecdotes about Sir Roger, and they contributed to the development of the novel as a revelation of manners and *mores,* even though they themselves wrote neither short stories nor novels. The picture they give of 18th-century life in London is revealing, important, and amusing.

Steele's literary achievements brought him success not only in the army. He received various court appointments, especially after the accession of George I in 1714, who knighted him in 1715. He had earlier been a member of Parliament but was expelled for "seditious" writing in his pamphlet called "The Crisis." He was married twice, each time to a woman who brought him some wealth. Whatever his income, however, he seems always to have exceeded it.

Steele engaged in various journalistic enterprises in addition to *The Tatler* and *The Spectator* (*e.g., The Guardian, The Plebeian*) and wrote other comedies besides "The Funeral." The best of his plays is "The Conscious Lovers."

RICHARD STEELE

Steel Engraving (*stēl ĕn-grāv′ĭng*). See *Engraving.*

Steelton (*stēl′tŭn*), a borough of Dauphin County, Pennsylvania, 3 m. S.E. of Harrisburg, on the Susquehanna River. It is on the Pennsylvania and other R.R.'s. Steel and cigars are the chief manufactures. It was settled in 1865 and incorporated in 1880. Population, 1950, 12,574.

Steelyard (*stēl′yärd*), an apparatus for weighing, so called from the Steelyard, a London market. The body to be weighed is suspended by the shorter arm of a lever, which turns on a fulcrum, and a weight is caused to slide upon the longer arm to produce equilibrium, its place upon this arm indicating the weight. The upper edge of the longer arm is notched to a graduated scale.

Steen (*stān*), JAN, Dutch genre painter, born at Leyden, Holland, in 1626; died Feb. 3, 1679. He studied art at Utrecht and afterward at Haarlem, where such painters as Adrian van Ostade and Jan van Goyen were his teachers; the latter became his father-in-law. Later he settled, after short periods in Delft and Haarlem, in Leyden. His works are numerous and he is represented in the great museums in Europe and in this country. The range of his genre topics is rather broad: from intimate interior scenes with well-dressed ladies visited by physicians or taking music lessons to the jolly meetings of citizens in taverns and to the marriage feasts and Twelfth Night meals. His colors are transparent and rich, his compositions embedded in a warm light. For picture, see next page.

Steeple (*stē′p′l*), a high tower usually mounted upon a church, but often on other types of public buildings. Designed to contain the bells of the building, the steeple is usually topped by a spire.

Steeplechase (*stē′p′l-chās*), a horse race

Official Netherlands Photo

A DOMESTIC SCENE. PAINTING BY JAN STEEN

run over a rough course, including obstacles such as ditches, streams, hedges, etc., across open country. Steeplechase racing, made popular in Ireland, is now frequently conducted on a track equipped with high hurdles rather than the natural obstacles of the open country. Both types are run, although the track races are more readily accessible to spectators. Some of the well-known steeplechase meetings in England are held at Liverpool, Manchester, and Birmingham. In the U.S., open-country steeplechasing was first introduced around 1865, and the National Steeplechase Assn. was founded in 1891.

Stefansson (*stĕ'fäns-sŏn*), VILHJALMUR, Arctic explorer, born in Arnes, Man., Nov. 3, 1879; died in Hanover, N.H., Aug. 26, 1962. He studied at the universities of North Dakota and Iowa and at Harvard Univ. While an anthropology instructor at Harvard, he decided to go to the Arctic for scientific investigation. From 1904 to 1919 he spent ten winters and 13 summers in Iceland and northern Alaska and Canada; he led a Canadian government expedition to explore the area north of Alaska and Canada, 1913-18. He was adviser on northern operations to Pan American Airways, 1932-45, and Arctic consultant at Dartmouth Coll. and curator of the Stefansson Collection there, 1947-62. The latter, containing over 70,000 books, manuscripts, and pamphlets, is probably the largest collection of polar literature in existence. Stefansson wrote 24 books and several hundred articles about the Far North, including "My Life with the Eskimo" (1913), "The Friendly Arctic" (1921), "The Adventure of Wrangel Island" (1925), "Ultima Thule" (1950), "Great Adventures and Explorations" (1947), "Northwest to Fortune" (1958), and "Cancer: Disease of Civilization" (1960). His "Arctic Manual" (1941) was used by the U.S. government in World War II.

Steffens (*stĕf'ęnz*), (JOSEPH) LINCOLN, journalist, born in San Francisco, Calif., April 6, 1866; died in Carmel, Aug. 9, 1936. He was graduated from the Univ. of California in 1889 and after studying in Germany and France embarked on a journalistic career. He held posts as city editor of the New York *Commercial Adviser* (1898-1902), managing editor of *McClure's* magazine (1902-06), and associate editor of *American* and *Everybody's* magazines (1906-11). He is best known, however, for his attacks against corruption in municipal politics and police systems, published in such books as "The Shame of the Cities" (1904) and "Upbuilders" (1909). He also wrote "The Autobiography of Lincoln Steffens" (1931).

Steichen (*stī'kęn*), EDWARD, photographer, born in Luxemburg, March 27, 1879. He came to the U.S. early in childhood. Although he began his work as a painter, he won recognition for his photography as early as 1900. Encouraged in his photography by Alfred Stieglitz (*q.v.*), who was then fighting to win recognition for photography as an independent art, Steichen went to Paris to study and work. There, in 1903, some of his photographs were accepted for exhibition at the Paris Salon although no photographs had ever been hung in the Salon before. Steichen had his first one-man photography show in New York in 1905 at the Stieglitz gallery known as 291. For many years he worked as both painter and photographer, but in 1920 he abandoned painting. From 1922 until 1938 he was chief photographer for the Condé Nast publications. In World War I he served as commander of an Army Air Service photographic division, and in World War II, of a Navy photographic unit. One of the major projects of the latter was "The Fighting Lady," a documentary film of life aboard an aircraft carrier. From 1947 to 1962 he was director of the photography department at the Museum of Modern Art, New York City. One of the notable exhibitions he created there was "The Family of Man," in 1955.

Stein (*stīn*), GERTRUDE, author, born in Allegheny, Pa., Feb. 3, 1874; died in Neuilly, France, July 27, 1946. She was educated at Radcliffe Coll. and at the Johns Hopkins Medical School. She left the U.S. for France in 1903 and returned only once, in 1934, for the performance of her opera "Four Saints in Three Acts" (music composed by Virgil Thomson, *q.v.*). In Paris she developed lasting friendships with a group of French abstract painters, including Picasso, Matisse, and Braque, and her writing was strongly influenced by their theories on the abstract in art. She soon developed her own unique style, which began to appear as early as 1908 in "Three Lives."

Although she has often been ridiculed for her manner of writing, which employs devices like seemingly meaningless repetition of words and phrases, use of words for their sound rather than their sense and almost complete absence of punctuation, she has a definite esthetic theory to explain her technique. For her, the purpose of prose is to describe movement, rather than static things. She has said of her own prose writing that it is similar to a strip of motion-picture film, in which each frame, although it contains nearly all of the elements of the preceding frame, nonetheless makes an advance over it. Her repetition of words and phrases is used in the same way: each makes an advance over the preceding one and thus attempts to give the same effect in writing as any given moment of sight gives to the eye. She felt that punctuation merely impedes action and that, since nouns are static, verbs are the most important words. Her conception of poetry, however, was that it was meant to describe the static and that a sound did not lose its beauty, but rather gained more, through repetition; thus her poetry consists in large part of repeated nouns.

Her works include "Tender Buttons" (1915), "Geography and Plays" (1923), "The Making of Americans" (1925), "Useful Knowledge" (1928), "Acquaintance with Description" (1929), "Ten Portraits" (1930), "Lucy Church Amiably" (1930), "Before the Flowers of Friendship Faded Friendship Faded" (1931), "How to Write" (1931), "Operas and Plays" (1932), "Matisse, Picasso, and Gertrude Stein" (1932), "The Autobiography of Alice B. Toklas" (1933), purportedly about her secretary-companion; "Portraits and Prayers" (1934), "Lectures in America" (1935), "Narration" (1936), "Geographical History of America" (1936), "Everybody's Autobiography" (1937), "Picasso" (1938), "The World Is Round" (1939), "Paris, France" (1940), "Ida" (1941), and "Wars I Have Seen" (1945). "Brewsie and Willie" (1946), about American soldiers in France, was published just before her death.

GERTRUDE STEIN

Stein (*shtīn*), HEINRICH FRIEDRICH CARL, BARON VOM, statesman and author, born in Nassau, Germany, Oct. 26, 1757; died in Westphalia, June 29, 1831. After studying at the Univ. of Göttingen, he entered the service of Prussia in 1780. As cabinet minister he instituted administrative reforms necessitated by the Napoleonic wars. When the king opposed his projects and outspoken manner, Stein resigned (1807), only to be recalled soon afterward. He carried through the Edict of Emancipation to abolish serfdom in Prussia, the granting of self-government to all Prussian towns, etc. A letter criticizing Napoleon forced him to resign, whereupon he fled to Bohemia and thence to Russia (1812), where he became influential in the formation of the Russian-Austrian-Prussian coalition against Napoleon. His administrative scheme for Prussia for a long time served as a model for other German states.

Steinbeck (*stīn'bĕk*), JOHN ERNST, author, born in Salinas, Cal., Feb. 27, 1902. He attended Stanford Univ. intermittently between 1919 and 1925, taking courses that interested him but not studying for a degree. From time to time he worked for cattle ranches, fish hatcheries, sugar refineries, and the like. He was a member of the first surveying party which entered the Big Sur region. After an unsuccessful attempt at newspaper reporting, he became a free-lance writer. His first three novels, "Cup of Gold" (1929), "Pastures of Heaven" (1932), and "To a God Unknown" (1933), met with no success, but "Tortilla Flat" (1935) attracted considerable attention. "In Dubious Battle" received (1936) a gold medal as best novel of the year by a Californian. "Of Mice and Men" (1937), a pathetic story of two tramps on a California ranch, was a best seller and was produced as a stage play and as a motion picture.

"Grapes of Wrath" (1939), a slashing attack on social conditions among migrant workers in California, with bitter criticism of labor contractors, was a best seller, won a Pulitzer Prize in 1940, and caused the Communists to hail Steinbeck as one of their own. Steinbeck rejected the Communist advances but continued his sympathetic portrayal of underprivileged and picturesque characters. In "The Winter of Our Discontent" (1961), a novel about social change in a New England town (for which he was chiefly

Courtesy Viking Press, N. Y.

JOHN STEINBECK

awarded the Nobel Prize, 1962), he attributes the sorrows of his people to human folly, ignorance, and error, rather than to exploitation.

Other writings by Steinbeck include "The Long Valley" (1938), "Sea of Cortez" (with E. F. Ricketts, 1941), "Bombs Away: The Story of a Bomber Team" (1942), a play called "The Moon is Down" (1942), "The Wayward Bus" (1947), "The Pearl" (1947), "A Russian Journal" (1948, with photographs by Robert Capa), "Burning Bright" (1950), "East of Eden" (1952), and "Travels With Charley" (1962). He also wrote the scripts for two documentary films, "Crisis" and "Lights Out in Europe," and served as a newspaper correspondent during World War II.

Steinberg (*stīn′bĕrg*), MILTON, clergyman, born in Rochester, N.Y., Nov. 25, 1903; died in New York City, March 20, 1950. Educated in New York City at City Coll., Columbia Univ., and the Jewish Theological Sem. of America, he was rabbi of the Park Avenue Synagogue in New York from 1933 until his death. He distinguished himself by his gift of adapting historical concepts of conservative Judaism to modern life. His writings include "The Making of the Modern Jew" (1934), "As a Driven Leaf" (1940), and "Basic Judaism" (1947).

Steinbok (*stīn′bŏk*), a small antelope native to South Africa. It has a reddish color, a long neck, and slightly curved horns. At the shoulder it measures about 24 in. The flesh is edible. It is found chiefly in thinly wooded and hilly places.

Steinmetz (*stīn′mĕts*), CHARLES PROTEUS, engineer and scientist, born in Breslau, Germany, April 9, 1865; died in Schenectady, N.Y., Oct. 26, 1923. He was a brilliant student at the Univ. of Breslau, but his activities for Socialism forced him to flee to Switzerland and thence to the U.S. (1889). For many years he was the chief consulting engineer of the General Electric Co., and invented devices which made possible the transmission of electricity at high voltage over long distances. He also developed several dynamos, electric motors, devices for artificial lighting, and other electrical inventions.

Steinway (*stīn′wā*), HENRY ENGELHARD, piano manufacturer, born Heinrich Engelhard Steinweg in Wolfshagen, Germany, Feb. 15, 1797; died in New York City, Feb. 7, 1871. Steinway became a maker of pianos in 1820, and in 1851 came to the U.S., where he and his sons established the famous piano-making firm of Steinway & Sons (1853).

Stelvio (*stĕl′vē-ō*), PASS OF, a celebrated road in Europe. It crosses the Ortler Mts. and is the highest road in the Alps. It was completed in 1828, and is still noted for its fine construction and the beautiful scenery of the region which it traverses. It passes over heights 9,055 ft. above the sea and is 33 m. long.

Stem (*stĕm*). See *Plants.*

Stendhal (*stän-dȧl′*), pen name of MARIE HENRI BEYLE, author, born in Grenoble, France, Jan. 23, 1783; died in Paris, March 22, 1842. He attended the École Centrale in Grenoble (1796-99) and then went to Paris to prepare for entrance into the École Polytechnique. He gave up this project almost immediately, however, when a powerful friend got him a post in the war office. He was sent to Italy and served for a time as sublieutenant in the army of Napoleon Bonaparte. Later he traveled over Napoleonic Europe as a government official. He served in the Russian campaign of 1812. For a number of years after the Restoration and after the Revolution of 1830, he lived chiefly in Italy, where he met some of the outstanding leaders in the Romantic movement, including Byron, Madame de Staël, Silvio Pellico, and Alessandro Manzoni, and began to write. His *"Rome, Naples et Florence"* (1817), and *"L'Histoire de la peinture en Italie"* (1817) are literary hack work and actually a sort of plagiaristic composite of several other writers. In these and in his later works, however, are many vivid impressions of Italian life and culture.

In 1821, Stendhal was suspected of being connected with the movement for independence and was obliged to leave Italy. He visited England and then settled in Paris, where he became known as a brilliant and witty conversationalist and as an intense individualist who disbelieved in the sentimentality of the Romanticists and conformed to no conventions. To this period belongs his psychological essay *"De l'Amour"* (1822), in which he described the growth of love and set forth his celebrated theory of crystallization. According to this theory, all beauty and interest are crystallized in the beloved, and beauty itself is the promise of happiness. Stendhal also

STENDHAL

Medal by David d'Angers (1788-1856)

published his "Vie de Rossini" (1823), "Les Promenades dans Rome" (1829), a novel, "Armance" (1827), and "Racine et Shakespeare" (1823), advocating a theater freed of the limitations of the classical unities and the Alexandrine verse form. Other works include five autobiographical studies and a life of Napoleon, all published many years after his death.

Stendhal's two great novels, "The Red and the Black" (1830) and "The Charterhouse of Parma" (1839) are his most outstanding work. They establish him as one of the most original of French novelists and the precursor of the naturalistic school of Balzac and Flaubert. Both novels are penetrating psychological studies of the motives and passions of the human heart. Himself an egotist and a skeptic, Stendhal asserted that self-love conditions all human actions and that the essential failing of man is his lack of sincerity to himself, to others, and in relation to his surroundings. Thus, Julien Sorel, the unscrupulous opportunist of "The Red and the Black," is finally caught in the monstrous web of lies and hypocrisy which he himself has woven.

Stendahl's work was little known and not at all popular in his lifetime, however Balzac recognized his genius in an article in the *Revue Parisienne* (Sept. 25, 1840), and, in 1864, a quarter of a century after his death, Taine wrote a memorable criticism of his work.

Stenography (*stê-nŏg′rȧ-fȳ*). See *Shorthand.*

Stephen (*stē′vẹn*), the name of 10 popes of Rome, who reigned within the period between 253 and 1058. See *Pope.*

Stephen, King of England, born at Blois, France, in 1097?; died Oct. 25, 1154. He was the second son of Stephen, Earl of Blois, and Adela, daughter of William the Conqueror, and nephew of Henry I of England. As Stephen was a titled nobleman of Normandy, he received large estates in England. He took the oath to aid in the succession of the daughter of Henry I, Empress Matilda, to the throne of England, but on the death of his uncle, in 1135, he claimed the throne. At that time he hastened to Britain and was crowned on Dec. 23, 1135, but Matilda landed in England in 1139 and with the support of her half-brother, the Earl of Gloucester, she conducted a successful civil war. Stephen was made a prisoner in 1141 and Matilda was proclaimed queen, but an insurrection soon arose against her government, which terminated in her being made a prisoner at Winchester Castle. The Earl of Gloucester was imprisoned, but was soon exchanged for Stephen, thus supplying the conditions that continued the war. Matilda having escaped from imprisonment, she retired in 1147 to Normandy, and the war was prolonged in her behalf by her son Henry. The Treaty of Wallingford brought the struggle to an end, in 1153, the agreement being that Stephen should remain king until his death, when Henry should succeed to the throne, which he did on Oct. 25, 1154, as Henry II. By this agreement the Anglo-Norman line ended, and the throne passed to the Plantagenet dynasty.

Stephen, SIR LESLIE, critic and author, born in London, England, Nov. 28, 1832; died Feb. 22, 1904. He was educated at Eton and King's Coll., London, and Trinity Hall, Cambridge, being graduated from the latter in 1854. Shortly after his graduation he was made a fellow at Trinity Hall, where he remained until 1864, when he moved to London to engage in literary work. In 1865 he published a work entitled "Sketches from Cambridge," which had formerly been printed in the Pall Mall *Gazette,* and in 1871 he became editor of the *Cornhill Magazine.* After serving for about 10 years as editor of that periodical, he resigned in 1892 to become editor-in-chief of the "Dictionary of National Biography," for which he wrote about 400 articles. He held the Clark lectureship of English literature at Cambridge in 1893. His first wife, Harriet Marian, who died in 1875, was the younger daughter of William M. Thackeray. Edward VII knighted him in 1902. His principal publications include "Hours in a Library," "Science of Ethics," "History of English Thought in the 18th Century," "Studies of a Biographer," and "English Utilitarians."

Stephens (*stē′vẹnz*), ALEXANDER HAMILTON, Vice President of the Confederacy, born in Taliaferro County, Georgia, Feb. 11, 1812; died in Atlanta, Ga., Mar. 4, 1883. Left a poor orphan at an early age, he was sent to Franklin Coll. (now the Univ. of Georgia) by a society which educated young men for the Presbyterian ministry. Stephens later reimbursed the society, for after his graduation in 1832 he decided to study law by himself.

He was admitted to the Georgia bar in 1834. He sat in the Georgia legislature (1836-42) and was elected to the U.S. House of Representatives as a Whig in 1843, serving there until 1859. Although opposed to the Mexican War (1846-48), he favored the annexation of Texas, in the belief that the new state would strengthen Southern power in the Congress. After 1852, he voted with the Democratic party, supporting Stephen A. Douglas's Kansas-Nebraska Act of 1854, which extended slavery to the territories. He also voted for Douglas in the Presidential election of 1860. Although strongly opposed to secession and desirous of preserving constitutional government in the South, he adopted the policy of the Confederate states after the secession of Georgia. He became Vice President of the Confederacy (1861-65) and was a member of the Confederate delegation at the Hampton Roads Conference which met with President Lincoln and Secretary of State Seward in a fruitless effort to reach a peace settlement (February, 1865). When the war ended, Stephens was captured and imprisoned at Ft. Warren, in Boston Harbor, from May to October 1865. Elected to the U.S. Senate in 1866, he was refused his seat because Georgia had not complied with Reconstruction measures. A few years later, he served as a member of the U.S. House of Representatives (1873-82). He was elected governor of Georgia in 1882.

Stephens edited the Atlanta *Daily Sun* (1871-73) and wrote two books: "A Constitutional View of the Late War Between the States" (2 vols., 1868-70), a valuable statement of the Southern position in regard to states' rights (*q.v.*) and the right of secession, and "A Compendium of the History of the U.S." (1875).

Stephens, JAMES, author, born in Dublin, Ireland, February 1882; died in London, England, Dec. 26, 1950. He began to write poems and stories at an early age, but was unable to have them published until "The Crock of Gold," a novel, was finally accepted for publication in 1912. Its success enabled him to devote himself principally to writing thereafter. He also served as curator of the Dublin National Gallery, for which he was qualified by his wide knowledge of Gaelic art, and he was also a figure in Irish politics, having participated in the movement which resulted in the formation of Eire. Much of Stephens' writing, both prose and poetry, stemmed from his interest in Gaelic language and literature. One of his purposes was to give modern Ireland a new mythology, and most of his fiction, in which the quality of folk literature is added to lyrical fantasy, reveals this aim. His books of poetry include "Insurrections" (1909), "The Hill of Vision" (1912), "Songs from the Clay" (1915), "The Rocky Road to Dublin" (1915), "The Adventures of Seumas Beg" (1915), "Green Branches" (1916), "Reincarnation" (1918), "Little Things" (1924), "A Poetry Recital" (1925), "Collected Poems" (1926), "Outcast" (1929), "Strict Joy" (1931), and "Kings and the Moon" (1938). Among his prose works are "The Charwoman's Daughter" (1912). "Here Are Ladies" (1913), "The Demi-Gods" (1914), "Irish Fairy Tales" (1920), "Deirdre" (1923), and "Etched in Moonlight" (1928).

Stephens, JOHN LLOYD, author and traveler, born in Shrewsbury, N. J., Nov. 28, 1805; died in New York City, Oct. 10, 1852. In 1822 he was graduated from Columbia Coll. and established a law practice in New York City. Failing health caused him to undertake an extensive trip to Europe, in 1834, and before returning to America he traveled through Egypt and Asia Minor. His travels were published in 1837 as "Incidents of Travel in Egypt and the Holy Land," and the following year he published "Incidents of Travel in Greece, Turkey, Russia, and Poland." He was commissioned by the U.S. government, in 1839, to negotiate treaties with the governments of Central America, and soon after published "Incidents of Travel in Central America, Chiapas and Yucatan." In 1841 he made a second tour of Yucatan in company with the artist Frederick Catherwood, and later joined in the enterprise of building a railroad across the Isthmus of Panama. His last published work, "Incidents of Travel in Yucatan" (1843), contributed valuable data regarding the antiquities of that region. He superintended the Panama railroad construction work from 1849 until his death.

Stephenson (*stē′vẹn-sŭn*), GEORGE, inventor, born near Newcastle, England, June 9, 1781; died at Chesterfield, Aug. 12, 1848. He was born of parents in moderate circumstances, and was first employed to herd cows at four cents a day, later working in gardens at eight cents a day. In 1796 he was employed to tend a colliery engine at a salary of $3 per week, and while there he studied reading and writing at odd times in the engine room. He then began to study the machinery with which he worked, and when 20, he became a brakeman. Close application to the duties caused his promotion to the position of engine-wright at Killingworth in 1812, where he received a salary of $500 a year. While there he was given permission by Lord Ravenworth to construct a traveling engine for the tramroads between the colliery and the port, 9 m. distant. He successfully completed a locomotive in 1814 and named it "My Lord."

This invention proved so successful that he was able to induce the promoters of a railway between Stockton and Darlington, who had planned to use horses for drawing their wagons, to adopt his locomotive and he was made engineer. The success of the enterprise caused his employment in the construction of a railway between

GEORGE STEPHENSON

Liverpool and Manchester, receiving for his services a salary of $5,000 a year. A locomotive made by him and his son Robert, called the "Rocket," was accepted by the company, and on a trial trip in 1830 developed a speed of 20 m.p.h. Thus, Stephenson became the originator of the steam railway, and soon after his first successes railroads began to develop in all parts of the civilized world. He visited Belgium and Spain in 1845 and was attacked by pleurisy, from which he never fully recovered. His last years were spent at his country seat at Tapton. See *Railroads*.

Stephenson, ROBERT, engineer, born at Willington Quay, near Newcastle-upon-Tyne, England, Oct. 16, 1803; died Oct. 12, 1859. He was the only son of George Stephenson. After attending school in Newcastle he attended the Univ. of Edinburgh. In 1823 he assisted his father in surveying the first railway, from Stockton to Darlington, and in 1824 went to Mariquita, South America, to spend three years as an engineer. After returning to England by way of Canada and the U.S., he aided in building the "Rocket" at his father's locomotive works, and subsequently became managing engineer of the London & Birmingham Ry. Among the enterprises projected by him are the bridge across the St. Lawrence at Montreal, two bridges across the Nile at Damietta, and the famous Britannia tubular bridge over the Menai Straits. He was made a member of Parliament in 1847, received the cross of the Legion of Honor from France in 1855, and was given a degree by the Univ. of Oxford. He was buried in Westminster Abbey. He published "Report on the Atmospheric Railway System" and "Description of the Locomotive Steam Engine System."

Steppes (*stĕps*), generally level tracts of treeless, arid land occurring in regions of extreme temperatures and loess soil. Specifically the name applies to the Russian plains occupying a part of Siberia, stretching across Southeastern Europe as far west as the Dnieper. These plains have a generally undulating surface with occasional ranges of low hills, and are mostly treeless and quite barren. In many places fertile regions of greater or less extent abound. Nutritious grasses cover most of the surface in the spring, but during the dry season of summer and fall the greater part is extremely arid and barren.

Stereochemistry (*stĕr'ē-ō-kĕm'ĭs-trȳ*). See *Van't Hoff, Jacobus*.

Stereophonic Sound (*stĕr-ē-ō-fŏn'ĭk*). See *Phonograph*.

Stereopticon (*stĕr-ē-ŏp'tĭ-kŭn*). See *Magic Lantern*.

Stereoscope (*stĕr'ē-ō-skōp*), an instrument whose purpose is to aid in attaining vision of a pair of properly prepared pictures, which together compose the stereograph. The first form of this instrument was invented by Sir Charles Wheatstone in 1838, but subsequently many improvements and several forms were devised. The common stereoscope has a double lens, or a pair of half-lenses, set in a small box, and through these the eyes of the observer look upon two pictures stationed at the proper focus some distance from the box. Photographs taken for use in instruments of this kind are from two aspects, one as seen with the right eye and the other as seen with the left, and are placed in a transposed position on a cardboard fitted to be held in a frame. When brought into focus, the instrument makes the images blend into one, which is greatly intensified and appears to be three-dimensional.

Stereotype (*stĕr'ē-ō-tīp*), a solid, rigid plate made from printing types for the purpose of stereotyping—a method of printing by which many repeats may be made without resetting type. Significantly, the word has come to be applied to anything which is characterized by lack of originality, or repetition to the point of monotony, as a "stereotyped" expression or phrase. For years there were only two general methods of making stereotypes for printing, one employing some variety of plaster to make the mold, the other a kind of papier-mâché. The papier-mâché or *wet mat* process was the one most widely used commercially throughout the 19th century, the new *dry mat* process coming to the fore only in recent years. The first known pioneer in stereotyping was a Chinese blacksmith, Pi-sheng, who invented a printing method using plates formed of movable types held together in a mastic base (1041). Sporadic attempts in medieval Europe produced solid plates used only for reproduction of art works, maps, and illustrated lettering, though as early as 1690 a book described a stereotyped process for printing similar to the later rediscovered papier-mâché method.

In 1701 Johannes Mueller, a German clergyman of the Reformed Church in Leyden, Holland, printed a book of prayers from stereotype plates in which all the types in a form were cemented together in a lead base—effective, but costly, since the type could not be used again for any other purpose. The next important step was taken by William Ged, an Edinburgh goldsmith, who devised the first practicable plaster mat, made with gypsum or plaster of Paris. Ged's method attracted enough attention so that he was appointed printer to the Univ. of Cambridge (1731); bitter oppositin from pressmen and printers made him give up the struggle; but his method was revived in 1800 by England's eccentric but inventive Charles Mahon, 3rd Earl of Stanhope, who joined forces with a London printer, Andrew Wilson. For years they labored to improve the process, but never succeeded in overcoming its drawbacks—slowness of operation, smudging of plates, and impossibility of making more than one metal cast from each plaster matrix. Meanwhile experimenters were at work in France, producing a locally used clay process as early as 1740. During this period Firmin Didot, who operated upon the early Mueller method, coined the name "stereotype" for the plates, derived from two Greek words meaning "rigid" and "type."

The *papier-mâché* (mashed paper) or *wet mat* process followed many experiments, and was patented in 1829 by a French printer, Claude Genoux. This basic process, later improved in methods and materials, made real speed printing possible, the first newspaper to employ it being *La Presse,* a Parisian daily (1852). In New York, Charles Craske and the New York *Tribune* were the pioneers in the field. In 1861, after years of experimenting, which produced Craske's flexible matrix, the *Tribune* began to print from full-page plates cast in a curve to fit Hoe rotary presses. High-speed newspaper printing was now launched. By 1880, 45 dailies had installed the process, and it was soon to become world-wide. The unfamiliar *dry mat* process, introduced around the turn of the century, was slow in gaining favor, and the papier-mâché method is still rather widely used, especially in smaller plants where much of the work must be done by hand.

In making a *wet mat,* type is set in the ordinary way, the form is locked up, and the type faces are brushed and oiled. The matrix is made by pasting together several sheets of soft paper, dampened and patted down until smooth, then placed over the types and beaten from the back of the mat with a stiff brush until the soft paper has been driven into every part of the type-face. A second reinforcement sheet of damp paper is beaten in; then the hollows in the back are filled in, a heavy blanket is spread over the top, and the matrix is placed in a steam-heated press to be dried under pressure. Removed from the press and separated from the type, the mat or matrix (called *flan* in France, *flong* in England) is placed in an iron casting mold which is screwed tight except for one open side through which molten metal is poured in. After the metal has set, the mold is unscrewed, the mat removed for reusing, and the metal plate prepared for the press by trimming the sides, smoothing, etc.

The *dry mat,* or cold stereotyping process, was developed to overcome unavoidable drawbacks of the *wet mat* process. The paste used on the paper may turn sour or moldy if they are prepared long in advance; wet mats are subject to blisters from uneven pasting or paste fermentation; frequent heating and cooling of type may cause distortion and destruction; the pasting is bothersome and slow; worst of all, the intense heat and steam endured by stereotypers is highly unpleasant and even detrimental to health. A semi-dry mat was produced in England by George Eastwood in 1887, and in 1893 he was granted the first patent on a dry mat. Improvements were made by Herrmann Schimansky of Berlin in 1895, and for some time Germany was the sole source of the dry mats, which were in fairly wide European use before their introduction into America. Henry A. Wise Wood, inventor of Autoplate casting machines, headed the first company (Wood Flong Corp.) to import dry mats on an extensive scale from Germany, and to start their manufacture after the war had cut off the supply from abroad (1917). Improvements were soon introduced by Wood and other producers, among them Geo. A. Kubler who founded the Certified Dry Mat Corp. of N.Y. (1923) and persuaded the New York *Times* to experiment with his product. The result was that the *Times* went over entirely to dry mats, followed by many other papers. Now most of the stereotyped newspapers in this country employ dry mats. In general, they are made from a plastic mass of wood pulp or some other substance which will take a deep, clear impression of the types and dry quickly after the mold is removed. Pressure is applied to the damp matrix to force the types deeply into it by a *calendar* (a roller mechanism), or by direct-pressure machines. Today's production from a single automatic casting machine is approximately 200 stereotypes per hour. The quality of printing is such that most moderate-priced books and magazines are now produced by the dry-mat process, and it is used even for many of those in the higher quality range. It has two drawbacks—as compared to the wet mat—liability to shrinkage, since the mat is dried after removal from the mold, and the necessity for more experience and skill on the part of workmen who make it and handle it. However, the shrinkage problem has been largely overcome, and the widening use of the process means that larger numbers of experienced workmen are available.

Sterility (*stĕ-rĭl′ĭ-tȳ*), the inability to produce offspring. This may be due to inability to conceive or to carry a pregnancy to a viable stage. Gynecologists generally define sterility as the inability to conceive. There are several types of sterility: *Primary* or *absolute* sterility means that the woman has never conceived. If sterility follows a previous pregnancy (whether or not it resulted in a living child) it is called *secondary* sterility. *Relative sterility* or *impaired fertility* means that the ability to conceive is decreased but not entirely absent.

Until recently the popular conception has been that sterility is the fault or misfortune of the wife alone. This is by no means true; in fact, in at least one-third of childless marriages barrenness can be attributed to some defect or disfunction of the husband. Thus the problem of sterility is really a problem of *sterile mating* and no study is complete without determining the fertility of both husband and wife.

Certain conditions are necessary for conception. Important among these are normal and regular production of sperm cells in the male and ova or egg cells in the female. This can be determined by careful history, examination, and observation by the physician consulted. An often overlooked factor is that coitus must take place at the time of ovulation (extrusion of the ovum from the ovary) in the female. Ovulation usually occurs some time during the tenth to the fifteenth day of each menstrual cycle in the normal healthy woman, though this may vary greatly. Since the life of the unfertilized ovum is brief, not more than 24 hours, and the fertilizing ability of the sperm cell also lasts only about 24 hours, it is obvious that coitus and subsequent fertilization must take place within 12 to 24 hours of ovulation. The genital ducts—that is, the seminal tubes in the male and the Fallopian tubes in the female—must be open to allow free passage of sperm and ovum. This condition can be determined by simple tests by the physician. The entire female genital (reproductive) tract must be healthy and free of infection.

Among the greatest causes of sterility in the female is infection in the Fallopian tubes, resulting in strictures and adhesions blocking their passages and openings. The most frequent cause of "closed tubes" is probably gonorrheal infection. (Abnormalities following chronic gonorrhea are also a frequent cause of impaired fertility or sterility in the male.) Other infections, however, such as may occur at the time of childbirth, and especially after an unclean abortion, or other conditions, such as ruptured appendix or peritonitis, may be the cause of blocked Fallopian tubes.

Other causes of sterility are simple displacements and also certain tumors of the internal female organs which are often easily correctable.

More rare causes of sterility are those occurring on a congenital or developmental basis. These include the infantile uterus—abnormally small and underdeveloped, and malformation or underdevelopment of the tubes and ovaries. In this category may be included the hormonal (endocrine) disfunctions wherein the organs and even the menses may appear normal, but certain secondary ovarian and other hormonal deficiencies preclude pregnancy. Often these conditions can be corrected after careful study and institution of proper endocrine therapy. Wide research is under way at present in this field of gynecology and female endocrinology. Sometimes sterility may be secondary to general hormone deficiency complicated by obesity. Proper weight reduction and controlled use of thyroid hormone and certain other endocrine preparations have often proved satisfactory in such cases.

Male abnormalities causing sterility include defects in the semen and sperm, impotence, and certain constitutional factors. If sterility in the male is a matter of functional impotence, then simple psychological treatment, rest, and a more rational way of living will usually overcome the difficulty. Fertility in the male, as well as in the female, may be increased by eliminating systemic infections and anemia, and by carrying out proper living habits and sexual temperance.

Artificial insemination is a much-discussed treatment of infertility due to an uncorrectable defect in the husband of a normal wife as proved by careful examination and study. This type of impregnation is not widely used, but has proved satisfactory in a number of cases. The legal aspects of the case, such as local laws concerning paternity and adultery, must be considered; there must be written consent by both husband and wife; and the identity of the donor must be unknown to either husband or wife. The donor, of course, must be chosen for proper eugenic qualifications, known to the physician, in addition to his fertility. Then the physician must select the proper time (carefully determined time of ovulation) for placing the donor semen (recently obtained) into the cervical opening of the wife aspiring to pregnancy. Often several attempts are necessary before pregnancy occurs.

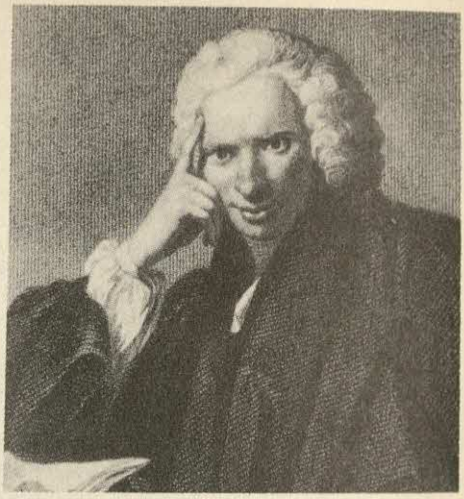
If sterility proves incurable in either husband or wife, the legal adoption of one or more children is the time-honored and perhaps still the best method of gratifying the natural desire for offspring.

Sterilization (*stĕr′ĭ-lĭ-zā′shŭn*), in general, the act or process of making an animal or human being sterile, barren, or unproductive. Another use of the word is in the bacteriological sense; *i.e.*, to destroy all living cells, especially microorganisms, by heat or chemical agents, as in the sterilization of instruments, food, etc. Scientific sterilization of males and females to prevent reproduction of major hereditary physical and mental defects involves an operation. In the male, one of the most common operations now employed is called *vasectomy,* or Rentoul's operation, in which a small part of each sperm duct is removed. The operation known as *salpingotomy* removes a small portion of each Fallopian tube of a female and thus renders her barren. In the elimination of hereditary defects practical eugenics advocates sterilization rather than segregation. Problems arising include the advisability of compulsory versus voluntary sterilization, legal limitations, religious opposition, etc. However, about 30 states in the U.S. now have laws permitting the sterilization of mental defectives and of certain mentally diseased wards of the state. Since introduction of these experimental laws in the first decade of the 20th century, approximately 40,000 sterilizations have been performed, about one-third of which were in California. Nebraska and South Dakota prohibit the marriage of any registered mental defective except on proof of previous sterilization. A decision of the U.S. Supreme Court in 1927 permitted states to pass sterilization laws to stop reproduction of hereditary defectives.

Stern, (*stẽrn*), OTTO, physicist, born Feb. 17, 1888, in Sohrau, Germany. He was educated at the Univ. of Breslau, was *privat-dozent* at the Technical High School in Zurich, Switzerland, in 1913, afterward teaching at Frankfort-on-the-Main (1914-21), Rostock (1921-22), and Hamburg (1923-33). In 1933 he left Germany for the U.S., where he was appointed research professor in the physics department and head of the research laboratory for molecular physics at the Carnegie Inst. of Technology in Pittsburgh, Pa. In 1934 a grant of $25,000 was made at the institute so that he might continue his researches. In 1943 he won the Nobel Prize for physics for his contribution to the development of the molecular-ray method of detecting the magnetic momentum of protons.

Sterne (*stẽrn*), LAURENCE, novelist, born in Clonmel, Ireland, Nov. 24, 1713; died Mar. 18, 1768. Sterne, the son of an English army officer stationed in Ireland, spent his childhood in a succession of army installations. After being graduated from Cambridge in 1736, Sterne took orders in the English church and in 1738 received a living in Yorkshire, where he spent the greater part of his life. He received other livings as well and became a prebendary of the cathedral at York, where his uncle was Archdeacon of Cleveland and Precentor of York.

Upon the publication of the first two volumes of his novel, "The Life and Opinions of Tristram Shandy, Gentleman," in 1760, Sterne's literary reputation was made. It was enhanced by the subsequent publication of seven more volumes between 1761-67. Sterne became a favorite of society in London and was received enthusiastically in France, where he lived and traveled for two and a half years after his health began to fail in 1762.



LAURENCE STERNE

Although Sterne's chief work is usually known simply as "Tristram Shandy," its full title is significant, for his novel was an important departure from the narrative of adventure which was characteristic of the English novels of Sterne's predecessors and contemporaries; *e.g.,* those of Defoe, Fielding, and Smollett. Instead of depending upon adventure for its interest, "Tristram Shandy" depends upon the humorous portrayal of eccentric characters. The chief of these are Tristram Shandy himself, who is the imaginary narrator; his father, Walter Shandy, a "philosopher"; his Uncle Toby, a retired army officer with a passion for building miniature fortifications and for playing war games; and Uncle Toby's servant, Corporal Trim. Sterne's greatest characters are perhaps Uncle Toby and Corporal Trim, retired soldiers, who no doubt spring from Sterne's memories of his childhood in army posts. All of Sterne's characters are presented by means of many highly amusing incidents illustrative of their eccentricities (and of the eccentricities of their author), but there is almost no thread of narrative to unify the entire novel.

Most notable for the masterly humor with which he portrays his characters, the value of Sterne's work is lessened for some readers (and no doubt enhanced for others) by his excessive sentimentalism and by the robust quality of his writing. Certainly his writing was most unclerical. So also was his life—for he was guilty of neglecting his wife (who was, to be sure, eccentric and difficult to live with), of affairs with other women, and of neglecting his work as a parish priest, although he was very active in diocesan politics.

In addition to "Tristram Shandy," Sterne published several volumes of sermons and in the last year of his life a separate work entitled "A Sentimental Journey Through France and Italy," a work which has many of the characteristics of his novel.

Stet (*stĕt*), Latin meaning "let it stand"; used in English as a direction in proofreading (*q.v.*), meaning to let a word or passage remain as originally written or printed, or to cancel a previous correction made in the manuscript.

Stethoscope (*stĕth'ō-skōp*), in medicine, an instrument used to listen to sounds in the chest to determine whether any illness is present. The process is termed auscultation. The first stethoscope was invented by René Théophile Hyacinthe Laënnec (1781-1826), a French physician. It consisted of a tube of wood about a foot long; one end of the tube was placed on the chest, and the other end consisted of a flat earpiece. The modern binaural stethoscope was invented by an American physician, George Philip Cammann (1804-63). It is made of flexible rubber and has two earpieces. See *Auscultation*.

Stetson (*stĕt'sŭn*), JOHN BATTERSON, hat manufacturer and philanthropist, born in Orange, N.J., May 5, 1830; died in DeLand, Fla., Feb. 18, 1906. Engaging in hat manufacture at an early age, he founded the John B. Stetson Co. which before his death became one of the largest hat-manufacturing companies in the world. Stetson hats were considered a standard of quality. He gave numerous financial contributions to DeLand Univ. in Florida, which was later renamed the John B. Stetson Univ.

Stettin (*shtĕ-tēn'*), or SZCZECIN, a seaport city of Pomerania, Germany, 78 m. N.E. of Berlin. It occupies a commanding position on the west bank of the Oder River, about 30 m. from the Baltic Sea, and is an important railroad center. The principal buildings include the Church of St. Peter, the city hall, the citadel, the central railroad station, and many fine school and church buildings. Stettiner Haff is an expansion of the Oder River north of the city and has an area of 200 sq. m. It is an important waterway, having deep-sea and excellent canal connections. The city of Stettin has long been an important port. It was an influential member of the Hanseatic League. From 1648 to 1720 it was occupied by the Swedes and was a French possession from 1806 to 1813. Stettin was heavily bombed by the Allies during World War II, and was captured by Russian troops in April 1945. At the Anglo-American and Russian conference at Berlin in August 1945, the German port of Stettin was incorporated into the Polish Administration Zone. Population, *ca.* 270,000.

Stettinius (*stĕ-tĭn'ĭ-ŭs*), EDWARD R., financier, born in St. Louis, Mo., Feb. 15, 1865; died in Greenwich, Conn., Sept. 3, 1925. After studying at St. Louis Univ. he went to Chicago, where he speculated in the grain market. In 1893, he engaged in manufacturing, and in 1909 became president of the Diamond Match Co. Later, in New York, he became a partner in the firm of J.P. Morgan & Co. When the U.S. entered World War I, in 1917, he was made surveyor general of purchases in the War Dept.

Stettinius, EDWARD RILEY, JR., industrialist and government official, born in Chicago, Ill., Oct. 22, 1900; died in Greenwich, Conn., Oct. 31, 1949. A graduate of the Univ. of Virginia, he rose rapidly in various industrial firms, becoming chairman of the finance committee of the U.S. Steel Corp. at the age of 35. In 1938 he was appointed chairman of the board of directors of U.S. Steel, resigning in 1940 to take a post on the Council of National Defense. During World War II he served as Lend-Lease (*q.v.*) Administrator and as special assistant to President Roosevelt in coordinating the war-production programs of the Allies. In 1944 he was appointed Under Secretary of State and then Secretary of State. In 1945 he headed the U.S. delegation to the U.N. Conference in San Francisco and, after the signing of the Charter, became chief U.S. delegate to the U.N. In 1946 he was appointed rector of the Univ. of Virginia.

Steuben (*stū'bẹn*), FREDERICK WILLIAM AUGUSTUS, BARON VON, general, born in Magdeburg, Prussia, Nov. 15, 1730; died in Steubenville, N.Y., Nov. 28, 1794. He entered the Prussian army in 1747 and served through the Seven Years' War, rising to the rank of adjutant general of the corps of volunteers in 1754. In 1762 he was made military aide to Frederick the Great. Retiring from military service, he was made a baron. In 1777 he sailed for America to assist the colonists in the Revolutionary War. Received enthusiastically by Gen. Washington, he was appointed (1778) a

FREDERICK VON STEUBEN

major general and inspector general of the American army, in which capacity he reorganized and disciplined the troops with outstanding success. Von Steuben was a member of the court-martial that tried Maj. John André (*q.v.*). He was instrumental in checking the invasion of Connecticut by Benedict Arnold (*q.v.*), and he was present at Yorktown at the surrender of Cornwallis. In 1790 Congress granted him a pension, several tracts of land in Virginia and Pennsylvania, and a township of land near Utica, N.Y., where he settled.

Steubenville (*stū'bẹn-vĭl*), a city in Ohio, seat of Jefferson County, on the Ohio River, 23 m. N. of Wheeling, W.Va. It is served by the Pennsylvania and the New York, Chicago & St. Louis R.R.'s. The city has an area of 5.8 sq. m. and lies on a plain *ca.* 645 ft. above sea level, surrounded by hills among which the residential areas are scattered. The region around Steubenville is highly industrialized, and the area has valuable deposits of coal, gas, petroleum, clay, and building stone. It is chiefly a steel city, but its other manufactures include pottery, brick and related clay products, paper, and glass. It is part of the Wheeling, W. Va.-Steubenville standard metropolitan area (1,530 sq. m.; pop., 1950, 354,092), which in 1954 had a value added by manufacture of $404,133,000; the figure for the city alone was $76,576,000.

Steubenville was founded in 1797 by Bazaleel Wells and James Ross on the site of Ft. Steuben. It was incorporated as a town in 1805 and named for Baron Frederick von Steuben (*q.v.*). The canalizing of the Ohio River, completed in 1929, lent impetus to the industrialization of Steubenville, and thousands of boats pass annually through the locks just north of the city. The population in 1940 was 37,651; in 1950, 35,872.

Stevens (*stē'vẹnz*), ALFRED, sculptor, born in Blandford, England, Jan. 28, 1818; died in London, May 1, 1875. He was the son of a house decorator and developed ability in designing while aiding his father. In 1833 he went to Italy, where he remained nine years and during a part of that time received instruction from Thorwaldsen. He taught architectural drawing in the London School of Design from 1845-48 and subsequently devoted most of his time to decorative modeling. His best work in sculpture is the monument to Wellington for St. Paul's Cathedral, London.

Stevens, EDWIN AUGUSTUS, American inventor, born July 28, 1795, in Hoboken, N.J.; died Aug. 7, 1868, in Paris, France. He was the son of the inventor, John Stevens (*q.v.*). At an early age he began to show such business acumen that when he was only 25 his father made the young man trustee of his considerable estate. He had already successfully managed a freight and passenger stage between New York and Philadelphia, when in 1830 he was made treasurer and manager of the newly chartered Camden & Amboy R.R. & Transportation Co., the first railroad line in New Jersey. In addition to his business ventures, he made several inventions, the most notable of which was an armored naval vessel which he and his brother built. However, they were unable to convince the heads of the U.S. Navy of its usefulness and it was never actually completed. On his death he bequeathed land and money for the establishment of the Stevens Institute of Technology at Hoboken, a project which had originally been conceived by his father.

Stevens, JOHN, inventor, born in 1749 in New York City; died Mar. 6, 1838, in Hoboken, N.J. Educated at Columbia Univ. (then King's Coll.), he became interested in the steamboat, and from 1788 on steam transportation remained his primary concern. In order to protect his inventions, which had already become numerous, he influenced the U.S. Congress to pass the first patent law in 1790 and the following year was one of the first to benefit by it, when he took out patents on his improvements on the steam boiler and the steam engine. He continued to work on the steamboat and by 1804 had built a small boat which was able to cross the Hudson and return. This success encouraged him to construct a 100-ft. steamboat, completed in 1808, shortly after Robert Fulton's boat, which had an English engine, while Stevens built his own, had made its trip to Albany and back. Since Fulton had obtained exclusive rights for steamboat navigation on the Hudson, Stevens' *Phoenix* made its maiden voyage from New York to Philadelphia (1809), thus becoming the first seagoing steamboat in the world. After this, Stevens began to devote his attention to steam transportation on land and to advocate the use of steam railways instead of canal transportation for passengers and freight. Stevens actually built a steam locomotive (1825), the first to be constructed in the U.S., although it was never used on a regular railroad line.

Stevens, RISË, singer, born in New York City, June 11, 1913. Educated at the Juilliard School of Music in New York City and at the Mozarteum in Salzburg, Austria, Risë Stevens has established an international reputation as a mezzo-soprano. She has appeared at the operas of Prague, Vienna, Rio de Janeiro, Buenos Aires, San Francisco, Chicago, and Hollywood, and has been one of the stars of the New York Metropolitan Opera Co. since 1938. She has also been popular in a number of film roles.

Stevens, THADDEUS, politician, born in Danville, Vt., Apr. 4, 1792; died in Washington, D.C., Aug. 11, 1868. After being graduated from Dartmouth Coll. in 1814, he settled at Lancaster, Pa., to practice law, and was later elected as a Whig to the state legislature. In 1849, he became a member of Congress, serving until 1853, and was a distinguished opponent of the Compromise of 1850 and the Fugitive Slave Law. He went with the Northern Whigs into the Republican party and was elected to Congress in 1859, serving until his death. He urged emancipation, the adoption of the Fourteenth Amendment to the Constitution, and the impeachment of President Johnson.

Stevens Institute of Technology (*stē′vẹnz ĭn′stĭ-tūt of tĕk-nŏl′ô-jy̆*), an institution of higher learning for men and women, at Castle Point, Hoboken, N.J. It was established in 1870 with funds provided by the will of Edwin A. Stevens, incorporated in the same year, and opened in 1871. There is a single undergraduate curriculum, devoted primarily to mathematics, physics, chemistry, and the various branches of mechanics, as well as to the study of economics and the humanities. In 1929 a summer engineering camp was opened near Johnsonburg, N.J. Graduate courses were first offered in 1930-31, and evening courses carrying graduate credit toward the degree of master of science were introduced in 1938. The college has an attendance of over 2,000 students and a faculty of 100 members.

Stevenson (*stē′vẹn-sŭn*), ADLAI EWING, Vice President, born in Christian County, Ky., Oct. 23, 1835; died June 14, 1914. His family moved to Bloomington, Ill., in 1852. After attending Central Coll., he studied law and was admitted to the bar in 1857. He was a Democratic member of Congress, 1875-77 and 1879-81. President Cleveland, in 1885, appointed him to the Post Office Dept., where he was in charge of patronage. In 1892 he was elected Vice President of the U.S. At the close of his term, in 1897, he was appointed a U.S. commissioner to secure adoption of international bimetallism. In 1908 he was nominated for the Illinois governorship but lost the election.

Stevenson, ADLAI EWING, governor, born in Los Angeles, Calif., Feb. 5, 1900 (grandson of above). Educated at Princeton and Northwestern Univs., he was admitted to the bar in 1926, after editing for a year his family's newspaper, the *Daily Pantagraph,* in Bloomington, Ill. He was a special government counsel, 1933-34, and in 1941 interrupted a successful legal career to become assistant to Frank Knox (*q.v.*), President Roosevelt's Secretary of the Navy (who was himself a Republican). Stevenson held various other government assignments during and after World War II, and was a U.S. delegate to the General Assembly of the U.N. in 1946 and 1947.

In 1948 he was elected governor of Illinois, on the Democratic ticket, receiving the largest majority ever voted to a gubernatorial candidate in that state. His administration gained wide repute for its successful reforms in many fields. In 1952 and 1956 he was the Democratic party's candidate for President, losing the elections to Dwight D. Eisenhower (*q.v.*). In 1961 he became U.S. ambassador to the U.N. He published "Call to Greatness" (1954) and other books.

Stevenson, ROBERT, engineer, born at Glasgow, Scotland, June 8, 1772; died July 12, 1850. His father died early in Robert's youth and he worked with his stepfather, Thomas Smith, in the construction of lighthouses. In 1791, when he was but 19, he was sent to erect a lighthouse on the island of Little Cumbrae. He invented a system of intermittent or flashing lights and designed famous Bell Rock Lighthouse on the east coast of Scotland. He was the grandfather of the novelist Robert Louis Stevenson.

Stevenson, ROBERT LOUIS BALFOUR, novelist and essayist, born Nov. 13, 1850, at Edinburgh, Scotland; died Dec. 4, 1894, at Samoa in the South Pacific. The dominating factor of his life was ill health. From childhood he moved in a continual pilgrimage from country to country in search of a mild climate, and his frequent returns to his beloved Scotland could never be prolonged. Ill health prevented his becoming an engineer, and, although he studied law, he was never able to practice.

He turned to writing. He laboriously trained himself, partly by copying the masters, until he had developed a clear, accurate, and flowing style which has been much admired by students of writing. His personal charm is evident in the sweetness, variety, and grace of his writing, especially in his essays and correspondence.

Records of his early travels in France and Germany were published as "An Inland Voyage" and "Travels With a Donkey in the Cévennes." A year later Stevenson came to America and crossed the continent in an emigrant train. In California he married an American widow, Mrs. Osbourne, whose son, Lloyd Osbourne, became his close companion and later his collaborator. The winter which he spent in a California mining camp provided the material for "The Silverado Squatters."

Back in England he published, in 1883, "Treasure Island," which he had at first called "The Sea Cook." It was immediately popular. Then came his volume of poetry, "A Child's Garden of Verses," followed by "Prince Otto" and, in 1886, what was perhaps his best-known work, "Dr. Jekyll and Mr. Hyde." The title of this symbolic story of a dual personality has become synonymous with deceitful and conflicting natures. It has been dramatized and filmed, just as "Treasure Island" has also been filmed.

In 1887, he sailed again for America. While at Saranac Lake he wrote "The Master of Ballantrae" and contributed regular essays to *Scrib-*

ROBERT LOUIS STEVENSON

Unfinished painting by Wm. Blake Richmond (1842-1921)

ner's Magazine. When a year later he took ship at San Francisco it was to have been for a pleasure cruise. But after visiting the Marquesas, Tahiti, Honolulu, Samoa, and even Australia, Stevenson returned to the beautiful island of Samoa. Here, in health and vigor which he had not previously known, he spent the remaining four years of his life. He built a house near the sea and ardently identified himself with the native Samoans in their struggle for independence. They adopted him, made him a chief and named him "Tusitala." In these final years he wrote "The Wrecker," "Island Nights' Entertainment," "Ebb Tide," and "Weir of Hermiston." In collaboration with Lloyd Osbourne, he wrote "The Wrong Box," which some critics have considered one of the most humorous books ever written in English. He died of a stroke of apoplexy and was buried near his beloved house at Vailima, Samoa.

Stevenson was a born story-teller. "Kidnapped," "Catriona," and the "Black Arrow," as well as "Treasure Island," are not only rousing adventure stories, but sound reconstructions of historical eras. He was also master of the entirely different technique of the short story. "Thrawn Janet" and "Markheim" are examples, and illustrate at the same time his absorption with the supernatural. He developed steadily as a fiction writer and "Weir of Hermiston," unfinished when he died, showed the most mature characterizations that he had yet drawn. His essays and letters, in which he is best revealed, are the vehicles of a humorous stoicism which is unexpected in a romantic nature such as his, and which is particularly gallant in an invalid and homesick man. "Virginibus Puerisque" and "Aes Triplex" perpetuate his sane and temperate morality.

Stevens Point (*stē-vęnz point*), county seat of Portage County, Wisconsin, 85 m. w. of Green Bay, on the Wisconsin River. It is on the Soo Line and the Green Bay & Western R.R.'s. The city is primarily a trading center with its roots in agriculture and associated commercial activities. Its industries include the manufacture of lumber and paper products, building materials, electrical equipment, statuary, and fishing tackle. The city is the seat of one of Wisconsin's state colleges. An interesting feature is its water supply which comes from a natural underground system, called the Plover Basin, believed to extend over an area from 6 to 12 m. wide and from 15 to 30 m. long. Stevens Point was settled in 1836 and was chartered as a city in 1897. Population, 1950, 16,564.

Stewart (*stū́'ẽrt*), ALEXANDER TURNEY, merchant, born near Belfast, Ireland, Oct. 27, 1803; died Apr. 10, 1876. He studied at Trinity Coll., Dublin, but emigrated to the U.S. without taking a degree. For some time he taught school in the vicinity of New York City. In 1825 he established a dry-goods business and subsequently founded one of the largest stores in the world on Broadway, New York City. He has been called the founder of the first modern-type department store. The Stewart store is now the "old" building of the John Wanamaker store. In 1876 he was sent as a commissioner from the U.S. to the exposition at Paris.

Stewart, BALFOUR, physicist, born in Edinburgh, Scotland, Nov. 1, 1828; died near Drogheda, Ireland, Dec. 19, 1887. He studied at St. Andrews and Edinburgh Univs. and in 1859 became director of the Kew Observatory. In 1870 he was made professor of physics at Owens Coll., Manchester, where he conducted important investigations regarding terrestrial magnetism and the relation between temperature and sun spots. He is regarded as one of the originators of the theory of spectrum analysis. His writings include "Conservation of Energy," and "Radiant Heat."

Stewart, WILLIAM MORRIS, lawyer and legislator, born in Lyons, N.Y., Aug. 9, 1827; died Apr. 23, 1909. In 1848 he entered Yale, but did not complete the course by graduation. However, he was given the degree of master of arts in 1865. In 1850 he went to California to seek his fortune in the gold fields; while there, he read law and was admitted to the bar. He was appointed attorney general of California in 1854, but removed to Nevada in 1860, where he became connected with the company that developed the Comstock Lode. In 1861 he was a member of the Nevada territorial council and became a U.S. Senator in 1864, serving in that body until 1875, when he resumed the practice of law in Nevada. He was re-elected to the U.S. Senate in 1887, 1893, and 1899. Stewart was identified with the Republican party until 1896, when he supported Bryan on bimetallism.

Stickleback (*stĭk'k'l-băk*), a genus of fish common to the fresh and salt waters of northern regions, so named from the sharp, free dorsal spines, usually ranging from two to 15. They are among the few fishes that build nests for the reception of the spawn, which is carefully guarded by the male until hatched and the young are capable of providing for themselves. The male assumes blue and red tints at the spawning season and actively invites females to deposit spawn in its nest until it is filled with ova, and when the young life appears it provides food for several days. The female deposits from 50 to 100 eggs, which are not confined to the nest of a single male, but distributed to the nests constructed by different individuals. Sticklebacks live only from three to four years and vary in length from 2 to 3 in. The best known and most widely distributed species have three spines, two on the back and one beneath, and range from Maryland to Labrador. In several places off the shores of Europe and in some of the interior waters of England these fishes are so numerous that they are caught and used for manure. They are seldom eaten, though their flesh is not objectionable.

Stick-Seed (*stĭk'-sēd*), the popular name of a weed native to Europe, but now found in many places of America. The stem is hairy and about 2 ft. high, and the small flowers bloom late in the summer. These plants produce seeds covered with small projections, and so are distributed by cattle and other animals. This weed grows in waste grounds and cultivated fields. Considerable care is required to eradicate it from cultivated land.

Stieglitz (*stēg'lĭts*), ALFRED, photographer, born Jan. 1, 1864, in Hoboken, N.J.; died July 13, 1946, in New York City. In 1892 he began editing the *American Amateur Photographer* and in 1897 he founded *Camera Notes*. He edited the latter until 1903, when he founded another magazine, *Camera Work*, which he edited until 1917. In 1905 he opened his first art gallery, the Photo-Secession Gallery, which, because its address was 291 Fifth Ave., came to be known as "291." This was later superseded by the "Intimate Gallery," which he opened in 1925, and still later by "An American Place," which he founded in 1929 and directed until his death, seventeen years later.

Stieglitz's work was significant in two fields. (1) As a photographer, he was one of the first to recognize and fight for the ideas that photography is an art in itself with unique methods, techniques, and functions of its own; that photography need not subordinate itself to, or copy, any other graphic art; that it, like any other art, can create beauty and reality in its own fashion. Many of his own photographs amply prove these points. (2) As an art critic, he introduced to America many of the principal modern French and American painters. Those exhibited for the first time in the U.S. at one or another of his three galleries include the painters Matisse, Rousseau, Cézanne, Picasso, Toulouse-Lautrec, and Braque, and the sculptor Brancusi. In addition, he made protégés of several young American painters, including John Marin, Marsden Hartley, Arthur Dove, and Georgia O'Keeffe, who later became his second wife. He was also one of the first to recognize the debt modern art owes to Japanese prints, the sculpture of the Pacific islands, and children's painting.

Stigmata (*stĭg'mȧ-tȧ*), in theology, term designating the traces of the five wounds which Christ suffered on the Cross from the spear and the nails. Stigmata have reappeared miraculously on the bodies of certain saints, *e.g.*, St. Francis of Assisi.

Stilbestrol (*stĭl'bĕs-trôl*), a synthetic estrogenic substance similar in nature to the natural estrogens (female sex hormones secreted by the ovaries) essential to normal female physiology and reproduction. In pure form it is a white crystalline powder, soluble in water. Therapeutically, stilbestrol is considerably more potent than preparations of the naturally occurring estrogens. It is used in modern therapy of severe menopausal symptoms and certain other female functional disorders.

Stilicho (*stĭl'ĭ-kō*), FLAVIUS, Roman general and statesman, born about 359; slain at Ravenna, Italy, Aug. 23, 408 A.D. He was descended from Vandal ancestors, his father being a captain of the imperial army under Emperor Valens, and at an early age he entered the imperial service. Theodosius was so impressed with his military ability and accomplished manners that he sanctioned his marriage to his niece, Serena, and in 384 appointed him as ambassador to Persia. When the emperor, in 394, bequeathed the Eastern Empire to his son Arcadius and the Western Empire to his son Honorius, he made Stilicho the guardian of the latter, with authority to administer the affairs of state in his name, while Rufinus was made guardian of the former. Shortly after the death of Theodosius, he suppressed an uprising in Africa, and in 403 signally defeated Alaric at Pollentia. The marriage of his son to the daughter of Theodosius and that of his daughter to the son of Honorius were consummated as means to aid his family in succeeding to the imperial throne. When his pretensions were discovered and made known, they excited the opposition of Honorius, who began to plan the capture and destruction of him and his supporters. However, Stilicho made an alliance with Alaric, but was compelled to leave Rome for the purpose of repelling a barbarian invasion, and during his absence the emperor caused the massacre of his friends. Shortly after, his army revolted and he

Courtesy National Gallery of Art, Chester Dale Collection (Loan), Wash., D. C.

STILL LIFE

Painting by Paul Cézanne (1839-1906)

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was compelled to flee to Ravenna, where he was slain by friends of the emperor. His death ended the long line of distinguished heroes who had defended Rome against the barbarians for 150 years, and within three months a horde of Visigoths under Alaric was at the gates of Rome.

Still (*stĭl*), ANDREW TAYLOR, osteopath, born in Jonesboro, Va., Aug. 6, 1828; died Dec. 12, 1917. He studied at Holston Coll., Tennessee, served as surgeon and major in the Civil War, as a volunteer from Kansas, and became the founder of osteopathy. In 1892, he was made president of the American School of Osteopathy at Kirksville, Mo. He published "Practice and Research" and "Philosophy of Osteopathy."

Still Life (*stĭl′ līf′*), a term in painting, signifying a subject matter of fruit, flowers, or other inanimate objects, sometimes combined with vessels, jewelry, etc. It is characteristic of this type of painting that the objects are always still—in French called *nature morte,* meaning "dead nature," never animated. Since no story is told, the artist concentrates on problems of composition, color, and light.

Stillman (*stĭl′man*), WILLIAM JAMES, author and painter, born in Schenectady, N.Y., June 1, 1828; died July 6, 1901. He was graduated from Union Coll. in 1848 and the next year went to England to study painting, where he was influenced by the Pre-Raphaelites. While in Europe he became an intimate friend of Louis Kossuth, the Hungarian revolutionist, who commissioned him to obtain the crown jewels of Hungary, a mission which failed. He took a life-long interest in European politics, and for some years served as Greek and Italian correspondent for the London *Times.* His publications include "On the Track of Ulysses," "Autobiography of a Journalist," "Billy and Hans," and "The Cretan Insurrection."

Stillwater (*stĭl′wôt-ẽr*), county seat of Washington County, Minnesota, on the St. Croix River, 20 m. N.E. of St. Paul. It is on the Northern Pacific, the Chicago & North Western and the Chicago, Milwaukee, St. Paul & Pacific R.R.'s. The manufactures include machinery, flour, cement, lumber products, barrels, farming implements, twine, and clothing. An annual feature is a festival commemorating the old logging days of the city's early history. The place was settled in 1843 and incorporated in 1854. Population, 1950, 7,674.

Stiltbird (*stĭlt′bẽrd*), or STILT, a species of wading birds. It is so called because its legs, in proportion to the size of the body, exceed in length those of any other bird. The body is about the size of that of a snipe, while the bare part of the legs measures 8 in., thus enabling it to run with remarkable rapidity. It usually nests in the marshy margin of a swamp or pond, but in some instances, especially where the ground is very wet, it builds a platform in the weeds and rushes.

U. S. Army Signal Corps Photo

JOSEPH W. STILWELL

Photo by U. S. Army Signal Corps

HENRY L. STIMSON

Several well-marked species of stiltbirds are native to North America, but the *black-necked stilt* is the most widely distributed. It is a common bird in the northeastern part of North America. This species is 14 in. long and has a white tail, red legs, and a black bill. A species called the *white stilt* is native to Africa and Europe.

Stilwell (*stĭl'wĕl*), JOSEPH W., army officer, born in Palatka, Fla., Mar. 19, 1883; died Oct. 12, 1946. Stilwell was graduated from the U.S. Military Acad. in 1904 and during World War I saw service in France and later with the Army of Occupation in Germany (1919). In 1920, he was assigned to duty in China and remained there for many years (1920-23, 1926-28, 1932-39). In 1942, he was sent on a special mission to China and promoted to the rank of lieutenant general. He was later named chief of staff under Generalissimo Chiang Kai-shek (*q.v.*) and later placed at the head of all U.S. forces in India, Burma, and China. In 1945, he was placed in command of the Tenth Army. In 1946 he took command of the Sixth Army, on the Pacific coast. Entrusted with one of the heaviest military responsibilities of World War II, he made notable use of his experience and ability in leading American troops against the Japanese, and was promoted to the temporary rank of general in 1944. "The Stilwell Papers," a collection of excerpts from the general's diary, papers, and letters, edited by Theodore H. White, was published in 1948. He was affectionately known among his troops as "Uncle Joe" and "Vinegar Joe." See also *Burma*.

Stimson (*stĭm'sŭn*), HENRY LEWIS, statesman, born in New York City, Sept. 20, 1867; died in Huntington, N.Y., Oct. 20, 1950. After studying law, he became the junior member of the law firm of Winthrop & Stimson. He became Secretary of State under President Taft, serving until 1913, and in 1927 he became governor general of the Philippines as successor to Gen. Wood. In 1929, he entered the cabinet of President Hoover as Secretary of State, as successor to Frank B. Kellogg, a position he held until 1933. During this period he attempted to draw the world's attention to the serious threat of Japanese aggression in China and the Far East. Though a Republican, he entered President F.D. Roosevelt's cabinet in 1940 as Secretary of War, devoting his energies to the military program necessitated by a world plunged into war. With the end of World War II, he retired from that position (1946). He wrote "The New Deal Under the Constitution," "Critique of Pure Science," and "On Active Service in Peace and War."

Stine (*stīn*). CHARLES MILTON ALTLAND, chemist, born in Norwich, Conn., Oct. 18, 1882; died in Wilmington, Del., May 28, 1954. Educated at Gettysburg (Pa.) Coll. and at Johns Hopkins Univ., he taught chemistry (1904-07) at Maryland Coll. for Women. He joined E. I. du Pont de Nemours & Co. in 1907 and remained with that concern thereafter as chemical director from 1924-30 and as vice president and director until his retirement in 1945. Stine was responsible, either by his own discovery or by discoveries made under his supervision, for advances in the development of various synthetic materials in many fields. Among those which were the complete or partial results of his work were nylon fabrics, synthetic rubbers, medicinal chemicals like the sulfa drugs, improved dyes, and high explosives.

Sting Ray (*stĭng rā*), a class of cartilaginous fishes of the ray family, with disk-shaped bodies and spiny scales. The long flexible tail with barbed spines swings rapidly upward when the fish is disturbed. Several dozen species of sting ray have been described. They are common to the warmer seas and some inhabit the fresh waters of South America. The sting is poisonous and capable of inflicting a painful and dangerous wound. Some of the species are from 10 ft. to 12 ft. long and so are powerful in defending themselves against intruders.

Stinnes (*shtĭn′ĕs*), HUGO, industrialist and financier; born in Mülheim, Germany, Feb. 12, 1870; died in Berlin, April 10, 1924. Entering business on his own behalf at the age of 22, he rapidly built one of the greatest industrial empires in German history. With holdings in the transportation, mining, and publishing industries, as well as extensive real estate, he exercised vast economic power. At the time of his death, he was said to be working on a plan to assume control of all German industry.

Stirling (*stẽr′lĭng*), a river port in Scotland, seat of Stirlingshire, on the Forth River, *ca.* 22 m. N.E. of Glasgow. It has railroad facilities and a good harbor. The surrounding country is an agricultural and stock-raising district. Among Stirling's manufactures are cordage, mineral oils, leather, soap, textiles and apparel, agricultural implements, and machinery. A noteworthy landmark is Stirling Castle, on a hill rising above the city; it was the birthplace of James II and the site of the coronation of Mary Queen of Scots, and of James VI of Scotland. Population, 1956, 26,758.

Stoa (*stō′ạ*). See *Stoics.*

Stock (*stŏk*), FREDERICK A., conductor and composer, born in Jülich, Germany, Nov. 11, 1872; died in Chicago, Ill., Oct. 20, 1942. He joined the Theodore Thomas Orchestra (later called the Chicago Symphony Orchestra) in 1895 as violinist and became director in 1905, after the death of Theodore Thomas. As a composer, Stock wrote overtures, symphonic poems, symphonies, string quartets, and songs. His overture "Festival March and Hymn to Liberty" (1910) is well known.

Stockard (*stŏk′ẽrd*), CHARLES RUPERT, biologist, born in Washington County, Mississippi, Feb. 27, 1879, died in New York City, April 7, 1939. Educated at Mississippi Agricultural and Mechanical Coll. and Columbia Univ., he taught at the Cornell Univ. Medical School from 1908, becoming a professor in 1911. He made important contributions to the knowledge of hormones, endocrinology, the origin of blood, and embryonic development when affected by certain chemicals; he also did research for the Huntington Fund for Cancer Research. Among his publications are "The Physical Basis of Personality" (1931) and "The Genetic and Endocrinic Basis for Differences in Form and Behavior" (1941, posthumous).

Stockbridge (*stŏk′brĭj*), a town in Massachusetts, in Berkshire County, on the Housatonic River, 12 m. s. of Pittsfield. It is served by the New York, New Haven & Hartford R.R. Principally a residential town and summer resort, it is world famous as the site of Tanglewood, an estate owned by the Boston Symphony Assn., where the annual Berkshire Symphonic Festival is held each summer. At Tanglewood, Nathaniel Hawthorne (*q.v.*) lived and worked; the house in which he wrote "The House of the Seven Gables" still stands. Stockbridge is also the home of the Berkshire Playhouse, a summer-stock theater which presents notable theatrical personalities during July and August. Among historic buildings are the Mission House (1739), the (Jonathan) Edwards Monument, and the Field cottage, scene of the first demonstration of the Atlantic cable by Cyrus W. Field. Nearby are many places of scenic interest. Stockbridge was settled in 1734 as a mission, known as Indian Town on the Housatonic. The first minister, John Sergeant, died in 1749 and was succeeded by Jonathan Edwards (*q.v.*). Stockbridge was incorporated as a town in 1739. Population, 1940, 1,500; 1950, 2,311.

Stockbridge, an Indian tribe (originally known as Housatonic) of the Mahican confederacy, which occupied part of the valley of the Housatonic River in southern Berkshire County, Massachusetts. In 1736 they were placed on a tract reserved for their use by the colonial government, and the village of Stockbridge was established, after which they became known as the Stockbridge Indians. They sided with the English in the French and Indian War, and their village suffered to such an extent from marauding parties that only about 200 survived at the end of the war. During the period 1785-87, the survivors moved to a tract provided for them by the Oneida Indians in Madison and Oneida counties. With the Oneida and the Munsee, they purchased from the Menominee a tract at the head of Green Bay, Wis. Moving there in 1833, they incorporated with the Munsee and have since formed one tribe. In 1856 all but a few who desired to become U.S. citizens removed to a reservation west of Shawano, Wis., where they still live. The Stockbridge-Munsee have virtually lost their identity as Indians and are similar in many respects to the average white family in the area. They have forgotten their native tongue, and all speak English.

Stock Exchange (*stŏk ĕks-chānj′*), an association organized and maintained by brokers as a market for the purchase, exchange, or sale of various securities, such as stocks and bonds. (*Stock* is the term used for shares in the ownership of a corporation, acquired by investing money in it; dividends, or shares of the profit, are paid to stockholders. *Bonds* are a corporation's evidence of indebtedness, representing, in effect, loans made by the bondholders and bearing interest which accrues to the bondholders.) Institutions of this class are incorporated under the laws of the state where they are organized, and business is conducted on a cash, or part cash, basis. Since 1958 U.S. regulations have required that 90 per cent of each purchase be on a cash basis (margin). In Europe, a stock exchange is called by the French term *bourse* or, in German, *Börse*. The New York Stock Exchange was founded in 1792 (during George Washington's first administration), and it is the largest and most important in the U.S. Other important institutions of this kind are located in Philadelphia, Chicago, Toronto, Cleveland, Detroit, Los Angeles, Montreal, Boston, and San Francisco.

Today the New York Stock Exchange is a highly efficient and well-organized mechanism with worldwide services. Essentially, however, it is still an auction room where the securities of large business enterprises, representing investors' savings, are continually appraised by a world consensus, and where these securities may be converted into cash, and cash in turn exchanged for securities. The trading floor of the New York Stock Exchange acts as a market place; the exchange itself does not buy or sell securities, nor does it in any manner fix security prices. It is an association of brokers who, as members of the Exchange, serve as agents for people desiring to buy or sell securities; they are entitled to a fixed commission.

In contrast to the 24 pioneers who organized the New York Stock Exchange, it now has 1,366 members, the majority of whom are partners in some 650 brokerage and investment firms. The trading list includes the securities of about 1,300 different enterprises representing the nation's business and industry. The total market value of these securities approached $295,000,000,000 in 1959.

Fundamentally, the trading rules conform to those of auction markets. The highest bid "has the floor," as has the lowest offer. The first bid on the first offer at a price has priority at that price. Each sale ends the auction, and a new market is then started. All bids and offers are made orally, no secret transactions being permitted. Prompt publicity is given to prices by means of the stock ticker.

Various terms have arisen in connection with the stock exchange. A *member of the Big Board*, dealing in bonds, stocks, shares, etc., is a member of the New York Stock Exchange; an *outside broker* or *over-the-counter broker* is a nonmember. In the speculative markets, a *bull* is a person who expects the market to rise, and a *bear* is a person who believes the market will decline. *Margin* denotes the amount of cash needed against the total value; thus 90 per cent margin means purchases are made on a 90 per cent cash basis. There are numerous other terms included in the jargon of the stock exchange, such as *boom, slump, short, long, wash sales, blue chips, growth stock, dollar cost averaging*. See also *Stock Market Regulations*.

Courtesy New York Stock Exchange

NEW YORK STOCK EXCHANGE

On the trading floor, brokers gather around the "posts," where the shares of various firms are traded

Stockholm (*stŏk'hōm*), the capital and largest city of Sweden as well as the capital of the province of the same name (area, 2,985 sq.m.; pop., *ca.* 300,000). The city is situated on the east coast between Lake Mälaren and the Baltic Sea, *ca.* 325 m. N.E. of Copenhagen, Denmark. The city occupies several islands as well as the mainland; its waterways and canals are spanned by many bridges. Stockholm is considered one of the most beautiful cities of Europe and is the most important commercial center on the Scandinavian peninsula, having extensive shipping and railroad facilities. The principal industries are shipbuilding and the manufacture of machinery, food products, textiles, chemicals, and rubber products. A seaport, the city is also a center for the export and import trade.

Stockholm is distinctive for the careful planning that directed its dramatic growth in the past century. Skyscrapers and modern buildings have been erected, cooperative residential districts have eliminated slums, and the urban transportation system includes a subway. A notable exception to the city's modernity is the island of Staden, where the first settlement took place and on which are preserved such historic buildings as the 13th-century Storkyrkan (cathedral), the 17th-century Hall of the Nobility, and the 18th-century Royal Palace. The market square of Staden was the site of the Stockholm Massacre in 1520. On an adjacent island is the 13th-century Riddarholm Church, burial place of many Swedish kings. Among noteworthy buildings in the modern sections of the city are the City Hall (designed by the Swedish architect Ragnar Östberg), the Riksdag (parliament) building, the Royal Opera House, the Concert Hall, the National Museum, and many other museums and churches. Stockholm is the cultural center of Sweden, the seat of a university, the Nobel Inst., an observatory, and other educational and scientific institutions. The city's parks are notable; its recreational features,

Courtesy Swedish Travel Information Bureau, N. Y.

STOCKHOLM CITY HALL

including beach resorts, make it a popular tourist attraction.

Stockholm was founded in the 13th century and by the middle of the 14th century had become an important trade center. It figured importantly in the conflict for power among the early rulers of Sweden, Norway, and Denmark, culminating in the coronation of Christian II ("the Cruel") of Denmark and Norway as king of Sweden in 1520. The Stockholm Massacre, planned to wipe out anti-Danish influence in Sweden, led to the revolt under Gustavus Vasa that put him on the throne of Sweden as Gustavus I. In the 17th century Stockholm became the capital of Gustavus II; and under his daughter and successor, Queen Christina, it became a center of culture and education. The program of building and expansion begun then continued and was intensified into the 20th century. Population, 1951, 745,936.

Stock Market Regulations (*stŏḵ mär′ḵĕt rĕg-ū-lā′shŭnz*), rules designed for the protection of investors in securities. In the Securities Exchange Act of 1934, creating the Securities and Exchange Commission (S.E.C.), that Federal agency was given the responsibility of regulating securities trading practices in both the exchange and over-the-counter markets. The act prohibits market manipulation, misrepresentation, and other fraudulent conduct in the purchase and sale of securities; provides for establishment of higher standards of conduct among those engaged in the securities business; regulates the amount of credit or margin which may be extended in the purchase of securities listed upon exchanges; requires companies with listed securities to file reports containing pertinent financial and other information needed by investors; protects against the unfair use of "inside" information by the managing officials of such companies; and generally provides for S.E.C. surveillance of the nation's securities markets. Closely related legislation contained in the Securities Act of 1933 requires registration with the S.E.C. of new security offerings, the purpose of which is to provide disclosure of the facts needed by investors in determining whether to acquire the securities, and prohibits misrepresentation, deceit, and other fraudulent conduct in the sale of securities generally. Other specialized regulatory measures generally protective of the interests of investors are administered by the commission. See *Securities and Exchange Commission; Stock Exchange.*

Stockport (*stŏḵ′pōrt*), a city in England, at the confluence of the Mersey and Thames rivers, 6 m. s. of Manchester. It is a railroad center and a market for produce and merchandise. Bituminous coal is mined in the vicinity. Its manufactures include cotton thread and textiles, metal products, and machinery. The site was a Roman military station; it gradually developed into a town, which in 1220 was made a free borough. Population, 1951, 141,660.

Stockton (*stŏḵ′tŭn*), a city in California, seat of San Joaquin County, on the San Joaquin River, *ca.* 64 m. N.E. of San Francisco. It is served by the Southern Pacific, the Atchison, Topeka & Santa Fe, and the Western Pacific R.R.'s. Stockton is a shipping center for the produce of the San Joaquin Valley; its manufactures include food products, agricultural and other machinery, trucks, and paper and leather goods. It is the site of the Coll. of the Pacific. Settled in 1847, it was incorporated and made county seat in 1850. Population, 1950, 70,853.

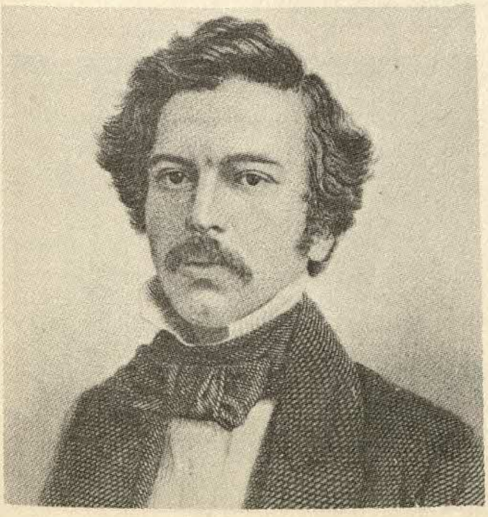
Stockton, FRANCIS RICHARD, known as FRANK R. STOCKTON, novelist and short-story writer, born in Philadelphia, Pa., April 5, 1834; died in Washington, D.C., April 20, 1902. He began a career as a wood engraver but soon turned to writing short stories. After serving on the editorial staffs of various magazines, he became assistant editor of *St. Nicholas* (1873-81) and thereafter devoted himself to writing. Many of his stories for children are included in "Ting-a-Ling" (1870). Perhaps his most famous adult story is "The Lady or the Tiger?" (1882; the title story in a collection, 1884). His novels include "The Casting Away of Mrs. Lecks and Mrs. Aleshine" (1886) and "The Adventures of Captain Horn" (1895).

Stockton, ROBERT FIELD, naval officer, born in Princeton, N.J., Aug. 20, 1795; died there, Oct. 7, 1866. He was a grandson of Richard Stockton (1730-81), a signer of the Declaration of Independence, and in 1811 entered the U.S. Navy as midshipman. In the War of 1812 he aided in the defense of Baltimore, later becoming a lieutenant, and in 1821 was sent to Africa to take part in the war with Algeria and to aid in securing colonization rights in the republic of Liberia. After returning to America, he engaged in business in New Jersey from 1823 to 1838 and promoted the construction of the Delaware & Raritan Canal. He re-entered the navy in 1838 and in 1845 was made commander of the Pacific squadron, taking possession of California for the U.S. government. Soon after he negotiated a treaty by which California was transferred from Mexico to the U.S. He retired permanently from the navy in 1850, and from 1851 to 1853 served as U.S. Senator. In 1861 he was a member of the American Peace Congress that met in Washington.

Stoddard (*stŏd'ẽrd*), JOHN LAWSON, traveler and author, born in Brookline, Mass., in 1850; died in 1931. He traveled extensively and lectured on travel topics. Among his numerous publications are: "Red-Letter Days Abroad" (1884), "Glimpses of the World" (1892), "The Stoddard Library" (an anthology, 1910), "Poems on Lake Como" (1914), "Rebuilding a Lost Faith" (1921), "Evening of Life" (1929), and others.

Stoddard, RICHARD HENRY, author, born in Hingham, Mass., July 2, 1825; died May 12, 1903. After attending the public schools of New York City, he worked in an iron foundry and privately studied literature. His first volume of verse was issued in 1849, entitled "Footprints," and in 1852 he published a second volume. He served in the New York customhouse from 1853 to 1870 and in the latter year became clerk to Gen. McClellan. For 10 years he was a literary reviewer for the New York *World,* and became literary editor of the New York *Mail and Express* in 1880. Among his poetic works are: "Book of the East," "Songs in Summer," "The Lion's Cub," "The King's Bell," "The Children in the Wood," and "Life, Travels, and Books of Alexander von Humboldt." He edited: "Loves and Heroines of the Poets," Rufus W. Griswold's "Poets and Poetry of America," and "Female Poets of America."

RICHARD H. STODDARD



Stoddard, WILLIAM OSBORN, author and journalist, born at Homer, N.Y., Sept. 24, 1835; died Aug. 29, 1925. He was graduated from the Univ. of Rochester in 1857 and took up farming, but soon engaged in newspaper work in Illinois. He was editor of the Chicago *Daily Ledger* and became a volunteer at the outbreak of the Civil War. After serving three months, in 1861, he became private secretary to President Lincoln, and after three years was made U.S. marshal of Arkansas. After 1866 he devoted his time chiefly to literature and journalism, publishing a large number of poems, biographies, and works of fiction. Among his chief books are: "Verses of Many Days," "Life of Abraham Lincoln," "The White House in War Times," "The Red Patriot," "The Spy of Yorktown," and "Long Bridge Boys."

Stoics (*stō'ĭḳs*), adherents to the doctrines of an ancient school of philosophy, founded in Athens by Zeno of Citium (Cyprus) in 308 B.C. The school acquired its name from the fact that its founder was accustomed to give instruction on a porch or *stoa.* Though much of its inspiration came from the teachings of Socrates and Aristotle, Stoicism did not absorb the full content of the philosophy of Periclean Athens. It exhibited a definite waning in the exuberance of Greek speculation, and expressed some of the weariness that had fallen upon ancient thinkers with the decline of the eminence of Athens. Like Socrates, the Stoics taught the identity of knowledge and virtue, but unlike him, they conceived virtue largely as a matter of subduing one's passions and achieving equanimity of mind freed from dependence upon external goods. They regarded the cosmos as a rigidly deterministic rational order permeated by a divine world-reason, and therefore held that to conduct oneself in accordance with the laws of nature should be the aim of all wise living. The Stoic outlook upon the world was thus opposed to the views of the other two important schools of philosophy in Hellenistic times: Epicureanism and Skepticism (*qq.v.*). However, its perspective upon things was congenial to the temper of the imperial civilization of ancient Rome, and obtained a wide following there. The outstanding literature of ancient Stoicism includes: "On Duties," by Cicero (1st century B.C.), the "Dialogues" of Seneca and the "Discourses" of the Roman slave Epictetus (1st century A.D.), and the "Meditations" of the Roman Emperor Marcus Aurelius (2nd cent. A.D.).

Stokes (*stōks*), SIR GEORGE GABRIEL, mathematician and physicist, born in Skreen, Ireland, Aug. 13, 1819; died Feb. 1, 1903. Stokes was called as professor of mathematics to Cambridge Univ. (1849); was elected a fellow in the Royal Society in 1851, of which he was secretary (1854-85) and president (1885 ff.); and was awarded the Rumford Medal in 1852. His studies in advanced mathematics resulted in his development of the modern theory of the motion of viscous fluids, his discovery of the nature of fluorescence, pioneer work on the variations in gravity, and important contributions to research on the undulatory theory of light, spectrum analysis, and optics.

Stokes, ISAAC NEWTON PHELPS, architect, born Apr. 11, 1867, in New York City; died Dec. 19, 1944, in Charleston, S.C. He was educated at Harvard Univ. and later studied architecture at Columbia Univ. and the École des Beaux Arts, Paris. He began practicing architecture in New York in 1897 when he became a member of the firm of Howells & Stokes. This firm, which remained in existence until 1917, designed many college buildings, including St. Paul's Chapel, Columbia; Woodbridge Hall, Yale; Dudley Memorial Gateway and the Music School, Harvard; the Baltimore Stock Exchange Bldg. and the American Geographical Society Bldg. in New York City; and many apartment buildings and low-cost housing projects. In 1900, Stokes became a member of the New York State Tenement House Commission and helped to draft that state's Tenement House Law. In 1911, he became architectural member of New York City's Art Commission, serving as its president from 1929 until 1938. Stokes was the author of a six-volume "Iconography of Manhattan Island" (1915-28) and of "New York, Past and Present—Its History and Landmarks" (1939).

Stokes, WHITLEY, author and Celtic scholar, born in Dublin, Ireland, Feb. 28, 1830; died Apr. 13, 1909. He was graduated from Trinity Coll., studied law in the Inner Temple, and in 1862 went to India to engage in the practice of law. While there he held several important positions under the government, drafted the code of civil procedure, and became eminent as a Celtic scholar. Besides making a careful study of the early Irish, he made extensive investigations of the Cornish and British. His work contributed largely to a better understanding of the ancient Irish language and the literature and history of the Irish people.

Stoke-upon-Trent (*stōk-ŭ-pŏn-trĕnt′*) or STOKE-ON-TRENT, a county borough and city of Staffordshire, England, on the Trent River and the Trent and Mersey Canal, 38 m. N. of Birmingham. Center of the pottery industry (the area is called the "Potteries"), it has coal mines, brick kilns, colliery-equipment works, and foundries and manufactures rubber tires. It was the home of Josiah Wedgwood, Josiah Spode, and Herbert Minton and is the seat of the North Staffordshire Technical Coll. The borough, formed (1910) of Stoke-upon-Trent, Hanley, Burslem, Tunstall, Fenton, and Longton, became a city in 1925. Population, 1951, 275,095.

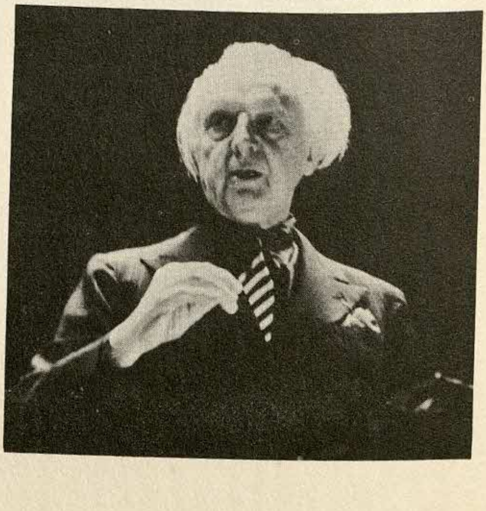
Stokowski (*stô-kôf′skē*), LEOPOLD ANTONI STANISLAW, orchestra conductor, born in London in 1887, the son of a Polish father and an Irish mother. A graduate of Oxford Univ., England, he studied music in France and Germany before going to the U.S. in 1905. Stokowski conducted the Cincinnati Orchestra (1909-12), and then became conductor of the Philadelphia Symphony Orchestra (1914-36). He also directed the Los Angeles Philharmonic and San Francisco orchestras; the All-American Orchestra which toured the Americas (1940-41), and a concert series in Mexico in 1944. He conducted the New York City Symphony (1944-45), New York Philharmonic (1947-50), and Houston Symphony (1955-60). In addition, he won acclaim for his transcriptions of compositions by Johann Sebastian Bach. His motion-picture performances, which demonstrated the possibilities for film use of great music, included "100 Men and a Girl" and the Walt Disney feature "Fantasia." Stokowski wrote "Music for All of Us" (1943). He was married (1945-55) to the heiress Gloria Vanderbilt.

Stola (*stō′lȧ*), a long garment worn over the tunic by the women of ancient Rome. It extended to the ankles, had a flounce below and broad folds above the breast, and was secured to the body by a girdle. Courtesans and women who had been divorced from their husbands were not permitted to wear the stola.

Stole (*stōl*), from the Latin *stola*, a robe, referring to the liturgical vestment worn by the

LEOPOLD STOKOWSKI

Courtesy of Newsweek

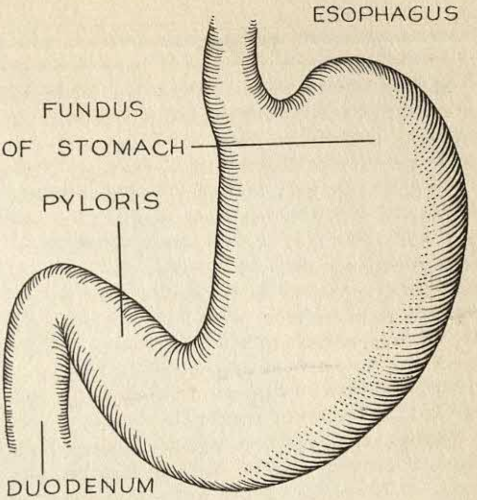


higher orders in the Roman Catholic Church. Consisting of a narrow strip of cloth, usually silk, ornamented with a cross, the ecclesiastical stole is worn over the surplice as a sort of scarf. In the Roman usage it is worn only at Mass. Its origin has been a subject for debate; some of the original sources thought to have inspired the stole are the ancient *stola,* the Jewish prayer-scarf known as a *tallith,* and the ancient orarion or neckcloth. Aside from the ecclesiastical stole, the term is used in lay clothing, such as in women's long scarfs of fur.

Stolz (*shtôlts*), ROBERT, composer and conductor, born Aug. 25, 1884, in Graz, Austria. He studied with his father, a conductor himself, with the composer Humperdinck, and at the Vienna Conservatory. He first conducted the band for a circus and later led the orchestra at the *Theater an der Wien,* where he remained for many years, conducting the first performances of such famous operettas as "The Merry Widow" and "The Chocolate Soldier." After the arrival of the Nazis in Vienna, he left that city, first for Paris, then for New York. He has written more than 1,000 songs, one of which is the well-known "Two Hearts in Three-Quarter Time," more than 30 operettas, and an opera, "Roses of the Madonna."

Stoma (*stō'mȧ*), in zoology, any simple mouthlike opening in lower animals. In botany, a small opening in the skin of stems and leaves through which the exchange of gases takes place.

Stomach (*stŭm'ạk*), a dilated part of the alimentary canal, serving as one of the principal organs of digestion. The human stomach is somewhat pear-shaped and baglike. It is situated on the left side of the abdomen, under the diaphragm, and the esophagus opens into it from above. The esophagus forms the tube through which the masticated food enters. An opening called the *pylorus,* a constriction near the smaller extremity of the stomach, allows passage into the small intestine, which has its beginning at that part of the alimentary canal. The stomach is composed of four layers; the serous, the muscular, the areolar or submucous, and the mucous coats. The *outer,* or *serous, layer* is thin, transparent, and smooth, and is a part of the lining of the abdomen. The fibers of the *muscular layer* are arranged lengthwise, obliquely, and circularly. The *areolar coat,* or *submucous layer,* contains blood vessels and lymphatics. The *mucous coat,* or *inner layer,* is provided with multitudes of glands, which secrete the gastric juice. This fluid is colorless and watery. It has a sour taste and odor and contains hydrochloric acid and an *enzyme,* called *pepsin.* The function of the stomach is to aid in digestion, and, when food enters, the gastric juice is poured out freely to change the insoluble proteins into soluble and diffusible substances, called *peptones.*



STOMACH

Muscular contractions serve to churn the contents of the stomach and thoroughly mix the food with mucus and juice, thus reducing it to a creamy fluid called *chyme,* which passes into the small intestine through the pylorus. This motion is independent of the will, and upon its vigorous action depends in a large measure healthful digestion. It is highly essential that the hygiene of the stomach be carefully observed, since health and bodily strength depend in a large measure upon healthful digestion. Its work is facilitated by chewing the food with care so as to mix it thoroughly with saliva. A large quantity of liquids taken at the time of eating dilutes the gastric juice, and cold water tends to check its flow for a time. A short period of rest just preceding and following a meal is healthful, and regularity in eating is likewise important, since a lapse of five to six hours between meals gives the stomach a brief period of rest.

Many animals have stomachs constructed much like that of man, but in others it is very different. In the kangaroo the stomach has two elongated sacs; in the camel it is divided into two compartments by a muscular band; in birds there are three small but distinct dilations of the alimentary canal; and in reptiles the stomach is a mere modification of the esophagus. Most invertebrates have a digestive tract with functions similar to those of the stomach in vertebrates. Among the diseases of the stomach are gastritis, cancer, and dyspepsia (*qq.v.*).

Stone (*stōn*), the name applied to all consolidated mineral substances, including granite, limestone, marble, slate, shale, sandstone, etc., all of which are used extensively for building purposes. The stones, or rocks, are subdivided into three classes: *sedimentary* (deposited as erosional or chemical products, usually in water); *igneous* (formed as a result of cooling of molten rock); and *metamorphic* (resulting from the effects of heat and pressure, which changes the physical appearance and mineralogical composition of previously sedimentary or igneous rocks).

Durable stones were esteemed highly as material for construction work in ancient times, and their use has been extensive in all periods of history for building aqueducts, bridges, and buildings. Indeed, the ancients possessed the power of quarrying and moving stone as large as any transported in modern times, and in some cases complete structures were hollowed out of single blocks and transported long distances. Herodotus describes such a structure completed on the Isle of Elephantine and transported by Amasis to Sais, a distance equal to the ordinary sailing of 20 days. It was about 10 ft. high, 18 ft. wide, and 27 ft. long, outside measurement, and the room within was 24 by 15 ft. and 6.6 ft. high. It is estimated that the weight was 9,944,750 lbs. The largest mass of stone that has been transported in modern times is the pedestal of the statue of Peter the Great at Leningrad, which weighs 3,234,000 lbs. After finding that rollers made of wood and iron were insufficient to transport this immense mass of stone, balls made of an alloy of tin, copper, and zinc were used.

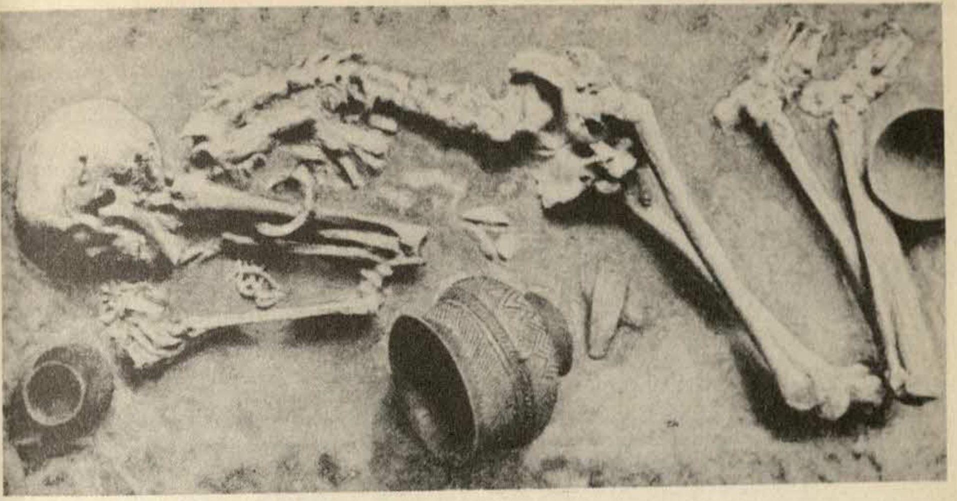
Granite is the most durable stone under exposure to the weather, as in monuments and the outer walls of buildings. Limestone also makes a durable and decorative facing stone for buildings, and, because relatively cheaper and easier to work, is more commonly used than granite. Sandstone is used extensively for buildings, but it disintegrates in climates where the atmosphere is alternately dry and wet, or warm and extremely cold. This is true likewise of marble, but this stone is an excellent material for finishing and decorating the interior. Slate is employed extensively for roofing. In modern times artificial stone made in the form of a concreted material is used extensively, especially in vases, tiles, building blocks, sidewalks, sewer pipes, tunnels, and bridges. See also *Cement; Concrete.*

Stone (*stōn*), FRED ANDREW, actor, born in Denver, Colo., Aug. 19, 1873; died in Hollywood, Calif., March 6, 1959. Educated in Topeka, Kans., he made his first stage appearance there in 1884; in 1886 he joined the Sells-Renfrew Circus. Starting in Boston in 1894, he costarred with David Montgomery for 22 years. Among his most famous productions were "The Girl from Up There" (1901), "The Wizard of Oz" (1903), "The Red Mill" (1906), "The Old Town" (1909), "The Lady of the Slipper" (1912), "Chin-Chin" (1914), "Jack-o-Lantern" (1917), "Tip-Top" (1920), "Stepping Stones" (1923; his daughters, Paula and Dorothy, appeared with him), "Criss-Cross" (1926), "Ripples" (1930), "Smiling Faces" (1932), and "Jay-Hawker" (1934). He moved (1936) to Hollywood, Calif., and appeared in many films, including "The Trail of the Lonesome Pine" (1936) and "Grand Jury" (1936). One of America's best-loved musical-comedy stars, Stone wrote his autobiography, "Rolling Stones," in 1945. He made his last stage appearance, a token performance, in "You Can't Take It With You" in California in 1950.

Stone, HARLAN FISKE, Chief Justice of the U.S. Supreme Court, born in Chesterfield, N.H., Oct. 11, 1872; died in Washington, D.C., Apr. 22, 1946. After attending Amherst Coll. he was graduated from Columbia Univ. Law School in 1898. In the following year he began private practice and also taught at Columbia Univ. He remained a member of the law faculty until 1905, when he resigned to devote his full time to private practice. In 1910, he returned to Columbia as dean of the Law School, holding this position until 1923, when he again returned to private practice. In 1924, he was appointed U.S. Attorney General by President Coolidge, and a year later was named to the Supreme Court. He became Chief Justice in 1941 and held that position until his death in 1946. As a member of the court he was considered a "liberal," supporting almost all of the "New Deal" legislation that was brought before the tribunal.

Stone, LUCY, reform advocate, born in West Brookfield, Mass., Aug. 13, 1818; died Oct. 18, 1893. She was graduated from Oberlin Coll. in 1847 and immediately became a lecturer for the American Antislavery Society. In 1855, she married Henry B. Blackwell, but under a previously contracted agreement retained her maiden name. From this latter circumstance, women who chose to use their maiden names after marriage were, until the practice gained relatively general acceptance, known as "Lucy Stoners." She lectured extensively on woman suffrage and was one of the organizers of the Woman's Suffrage Assn.

Stone Age (*stōn āj*), the term applied to a period of time, or a condition of civilization, which is marked by the use of tools and weapons made of stone, instead of metals. When employed in this sense the term age does not imply a fixed number of years, but signifies a period of time in which certain conditions existed, and the period covered may be of long or short extent, or of early or recent occurrence. Besides, the stone age is of variant length and confined to different periods in the history of peoples not closely associated. For instance, the stone age is thought to have ended in Europe about the year 1200 B.C., while it existed among primitive tribes much longer. It is usually divided into two periods, known as the *paleolithic,* or *earlier,* and the *neolithic,* or *later.* This distinction is made because the implements of the paleolithic age are found with the remains of animals now extinct, while the remains of tools of the neolithic period



STONE AGE GRAVE

occur with animal remains resulting from species represented by living forms. The former are different in that they are rudely constructed and entirely of flint, while the latter are finely formed and polished and in many cases they are made of various kinds of stone.

Implements of bone occur in both periods of the stone age, but their construction is marked by greater fineness in the later period. Among the implements are arrowheads, daggers, spears, ax-hammers, knives, borers, saws, chisels, scrapers, and hatchets. Highly polished axes of fibrolite and jade have been found in the vicinity of Lake Constance, Switzerland, and near Breslau, Germany. The American Indians left many remains of stone implements, especially axes, hammers, hatchets, spears, arrowheads, and utensils for performing domestic work. A large number of remains of the stone age have been secured from the mounds of the Mississippi valley and from the cave dwellings in New Mexico and the surrounding regions. Excavations and explorations of mounds and caves have led to the conclusion that the primitive peoples practiced agriculture, reared domestic animals, and possessed apparatus for catching fresh-water and deep-sea fishes. The stone age was succeeded by the bronze age and that again by the iron age. See also *Pre-History*.

Stonechat (*stōn'chăt*), a bird of the warbler family, native to the region extending from Central Europe to the northern part of Africa. It has a short bill and long and rounded wings. The male is finely colored, being chestnut in front and lighter backward. The female is somewhat smaller in size and duller in coloring. This bird is migratory on the continent of Europe, moving southward in winter, but remains throughout the year in England.

Stone Circles (*stōn sẽr'ḳ'lz*), or STONE KIST, in pre-history, a grave chamber covered by a round barrow. It dates back to the neolithic period (*q.v.*) but remainders of such tombs can be found which originated in the early bronze period.

Stonehenge is the name applied to an extensive group of standing stones in Salisbury Plain, about 7 m. N. of Salisbury, England. It consists of a large central stone, around which are two circles and two ovals. The inner circle consisted originally of about 40 stones, which were 6 ft. high, and the outer of about 30 upright stones with an equal number of blocks placed across the top. The two circles are about 9 ft. apart and at present 43 stones still remain, though 15 have fallen or been broken down. Besides these, a number of the stones forming the two ovals are still to be seen. The largest stones are 15 ft. above the surface of the ground and indicate that they were hewn and brought from a distance. Few traces of such remains are found in South Europe and North Africa.

Stone Fly (*stōn' flī*), an aquatic insect with a long, flat, narrow body whose hind-wings are broader than the fore-wings. The larvae live in water.

Stoneham (*stōn'ạm*), a town in Middlesex County, Massachusetts, 9 m. N. of Boston, with which it is connected by the Boston & Maine R.R. The place was settled in 1645, but remained a part of Charlestown until 1725, when it was incorporated under the present name. Population. 1940, 10,765: in 1950, 13,229.

Stone Mountain (*stōn moun'tĭn*), an elevation about 16 m. N.E. of Atlanta, Ga., about 870 ft. high by 5,000 ft. long and composed of light gray granite. Funds were raised to transform it into a memorial to the valor of the South in the Civil War. Bas-relief figures of Confederate leaders were carved on the north face of the massive rock as a Confederate memorial. The original sculptor was Gutzon Borglum (*q.v.*), who was succeeded in 1925 by H. Augustus Lukeman.

Stones (*stōnz*), PRECIOUS, the term applied to rare and beautiful stones, often used as a synonym of gems, but the latter is more properly the name of precious stones after they have been engraved or cut to form articles of ornament. There are three general classes of precious stones, and these are found widely distributed in many parts of the world. They include the carbon, alumina, and silica classes. The diamond is the only precious stone of the carbon class, being made up of pure carbon, and is the hardest of the precious stones. Stones of the alumina class are properly called *sapphires.* They are composed of pure alumina, but are colored differently, and include the true sapphire, the oriental topaz, the oriental amethyst, the oriental ruby, and the oriental emerald. To the silica class belong the opal, the amethyst, and the agates, which include the onyx, carnelian, chalcedony, sardonyx, and bloodstone.

Diamond, ruby, sapphire, and emerald are the most valuable of precious stones. To bring out the sparkle and luster it is necessary to cut and polish them with considerable care. Fine effects are obtained by making what are known as *cameos* and *intaglios,* the former having the design above the general surface and the latter having the design sunk below the surface. The best result in securing the finest color effect is obtained by cutting the surface smooth and rounded, while, on the other hand, the sparkle is brought out most prominently by cutting to form many faces or facets. Besides its use for ornamental purposes, the diamond has many industrial uses. Various stones are employed for jewels in watches. Very beautiful imitations of precious stones are made of glass, called *strass,* or *paste,* which can be accurately colored to resemble genuine stones. See also *Diamond; Sapphire;* and the color plate, *Precious Stones,* in Volume IX.

Since early times, precious and semi-precious stones have been associated with particular months. In this association they are known as *birth-stones* and possession of one's birth-stone is supposed to bring good luck. According to tradition, the garnet is the birth-stone for January; the amethyst, February; aquamarine or bloodstone, March; diamond, April; emerald, May; pearl or moonstone, June; ruby, July; peridot or sardonyx, August; sapphire, September; opal or tourmaline, October; topaz, November; turquoise or lapis lazuli, December.

Stoneware (*stōn'wâr*). See *Chinaware; Pottery.*

Stony Point (*stōn'ȳ point*), a town in Rockland County, New York, 36 m. N. of New York City, on the West Shore R.R. It is situated on a rocky promontory of the Hudson River, which was fortified by the colonists in the Revolutionary War. In May 1779 it was captured by the British under Gen. Sir Henry Clinton. On July 15-16, Gen. Anthony Wayne retook Stony Point with newly trained light infantry in a daring bayonet charge. The fortifications were destroyed, and Wayne withdrew on July 18. A battlefield reservation and museum were later established on the site. Population, 1950, 5,485.

Stoppage in Transit (*stŏp'ĭj in trăn'sĭt*), the term applied to the stoppage of a shipment of goods while they are on the way from the seller to the buyer, owing to the fact that the shipper has not been paid. Such stoppage is not based as a matter of right upon a contract between the parties, but is permitted in mercantile usage as a protection to the seller in a case where the buyer has become insolvent. However, stoppage in transit can take place only after the goods have left the possession of the seller and before they have been delivered to the buyer.

Storage Battery (*stōr'ĭj băt'ēr-ȳ*). See *Battery.*

Storax (*stō'răks*), a balsam obtained from the storax tree, known as *styrax* to the ancients, native to the region adjacent to the Mediterranean. The balsam is obtained by making incisions in the bark. It is a fragrant resinous substance, has a pungent taste, and is used to some extent in medicine.

Stork (*stôrk*), a genus of wading birds which belongs to the heron and bittern family. About a dozen species have been enumerated. The *common white stork* of Southwestern Europe is tall and stately, has a height of about 4 ft. when standing, and the body measures 3½ ft. in length. The bill is long and straight, the eyes are surrounded by naked skin, the neck is long and arched, and the color is white with slight black markings. Storks arrive in the greater part of Europe in February and March, and in autumn pass to the warmer regions of Asia and Africa, making their migratory movements mostly by night. They build their nests principally on the roofs of houses, but in some places boxes are provided for that purpose because of a belief that good luck attends the house on which a stork nests.

The parents show remarkable affection toward their young, while aged birds are treated with marked kindnesses. Before migrating from their summer haunts they gather in large flocks, and, having no voice, they make a peculiar clatter with their mandibles. Storks rear annually three to five young, which they feed in their nests until matured to a stage ready for flight, when they are trained by the parents to move on the wing. The food consists mostly of lizards, small mammals, insects, snakes, frogs, fishes, and offal. A species of black stork is common to Poland and Northern Germany, whence it moves southward in the fall. The American stork, which is common to South America, and the adjutant bird are allied to the white stork.

Storm (*stôrm*), a disturbance of the ordinary conditions of the atmosphere that, unless specifically qualified, may include any or all meteorological disturbances, such as wind, rain, snow, hail, thunder, etc. This general term may be further restricted by some descriptive adjective, as, *e.g.*, sandstorm, dust storm, hot wind (such as the khamsin or foehn or chinook), cold windstorm (such as the norther or the pampero), cold rainstorm, heavy snowstorm without wind or one with wind (such as the blizzard). All parts of the world are subject to storms. The most violent storms occur generally in the tropical regions, frequently continuing for several days.

Storms migrate generally from the equatorial region of America northward to the Arctic Ocean. The storms visiting the Eastern Seaboard originate in the region lying between Texas and Saskatchewan, or the Pacific Ocean, Alaska, the Gulf of Mexico, or along the Eastern Seaboard. The direction of movement of storms is influenced notably by the prevailing winds, as well as by the contour of the earth's surface; and their speed of movement can vary greatly from one day to the next. The area affected by storms varies greatly, with larger disturbances seldom less than 500 m. in width.

HURRICANES: These are large revolving storms accompanied by violent, destructive winds, heavy rains, and high waves and tides. Hurricanes originate in all tropical ocean areas, except the South Atlantic, and usually move from low to higher latitudes with increasing speed, size, and intensity. (In the areas of the Indian Ocean, China Sea, and Western Pacific, the name typhoon is used.)

The winds whirl counterclockwise (in the Northern Hemisphere) in the storm, with the highest speeds in a circular band beginning at the edge of the "eye" and extending out 20 m. to 30 m. or more. In this area, wind speeds may reach 150 m.p.h., with brief gusts at even higher speeds. At the center, there is usually a small, cloudless core from 5 m. to 20 m. across. This core is called the "eye," since the sky is often clear or only partly cloudy and the winds are usually very light. The area of destructive winds along the path of a hurricane may be from 25 m. to 500 m. wide. As the storm develops and moves forward, it may traverse a path several thousand miles long—as measured from its birthplace in the Caribbean or Tropical Atlantic until it moves inland over the continent or blows out into the North Atlantic.

While the winds of the hurricane are blowing at great speed around the center, the entire storm may move forward very slowly, sometimes even remaining stationary for a short time. This is especially true while the hurricane is in the tropics, where the forward speed is usually 15 m.p.h. or less. As the hurricane moves farther from the tropics, the forward speed usually increases and, in extreme cases, may reach 50 m.p.h. or more.

The winds of a hurricane can do great damage, although they do not have the force of a tornado. The greatest loss of life during hurricanes is caused by drowning. As the storm moves forward, it often piles up huge waves, which cut off—or completely cover—low-lying beaches and islands. The ocean level may rise 6 ft. or more in a few minutes. Most hurricanes are accompanied by torrential rains, which cause additional damage.

The modern forecast system of the U.S. Weather Bureau—with its rapid and widespread broadcast of warnings—and the prompt evacuations handled by the police, Red Cross, Civil Defense, and Coast Guard have reduced loss of life tremendously. See also *Radar*.

TORNADOES: These are violent local storms with whirling winds of tremendous speed. A tornado is usually recognized as a rotating, funnel-shaped cloud which extends toward the ground from the base of a thundercloud. Its color varies from gray to black. All tornadoes have one common characteristic—the rapidly rotating winds that cause them to spin like a top. When nearby, a tornado usually sounds like the roaring of hundreds of airplanes. It is one of the smallest and most dangerous of all storms.

An average of slightly over 200 deaths result from tornadoes each year in the U.S. The chance of a tornado striking any particular spot is extremely small. The reason for this is that the average tornado path is only 16 m. long and less than ¼ m. wide. Tornado paths have varied in length, however, from a few feet to nearly 300 m. The width of the paths has ranged from 9 ft. to more than 1 m.

At least seven tornadoes have occurred with paths over 200 m. long. The longest officially recorded tornado traveled 293 m. in Illinois and Indiana on May 26, 1917, and lasted for 7 hr. and 20 min. The forward speed of this tornado was 40 m.p.h., which is about average. Forward speeds have been known to range from almost stationary to as high as 68 m.p.h.

Tornadoes start to form several thousand feet above the earth's surface, and some never reach the ground—or they may touch the ground and rise again. Tornadoes usually occur in connection with thunderstorms, especially those from which hailstones fall to the ground. Tornadoes may form in a series of two or more, in which case there is a large, primary tornado and one or more secondary, or lesser, storms.

Tornado formation requires the presence of layers of air of contrasting temperature, moisture, density, and wind-flow characteristics. Cool, dry air from the west or northwest moves over warm, moist surface air. When this occurs and is accompanied by a narrow band of strong winds at intermediate levels, there are complicated energy transformations which can produce a vortex or a whirl. It seems probable that a tornado occurs only when there is a precise combination of several rather common, but highly variable, weather conditions.

The surface wind, in connection with the development of tornadoes, is usually from the southwest. Nearly two-thirds of all tornadoes move from that direction. Seven-eighths of the tornadoes move from some westerly direction, *i.e.*, either from the southwest, west, or northwest. However, tornadoes have been known to come from almost any direction, even stopping their forward movement, turning, and looping their paths. A 1942 tornado in Buchanan County, Iowa, caused widespread destruction in a crescent-shaped path, moving from southeast through west and north to northeast. A Michigan tornado, in 1946, made a circuitous path from Windsor, Ont., to Detroit, Mich. It frequently happens that several tornadoes occur on the same day and move in nearly parallel lines.

Destructive effects of the tornado are terrifying. Strong buildings are torn apart and scattered about like kindling wood; large trees are uprooted and the bark stripped off; people and farm animals are whirled through the air and then dashed to earth; bridges are wrenched from their foundations. The terrific force of the whirling winds within the storm is demonstrated by the shearing off of large tree limbs by sailing pieces of tin roof; by straws and slivers of wood driven deep into boards and posts; and by the penetration of large pieces of wood—javelinlike—deep into the earth.

Tornadoes occur in the U.S. and in many other parts of the world, but no place is more favorable for their formation than the central part of the mid-continental U.S.

Systematic study of the occurrence and direction of winds has led to the establishment of regular routes of travel across the ocean. When advantage is taken of the winds and of ocean currents, the time required by vessels for sailing from one port to another is diminished materially. Storms have a modifying effect upon the character of seasons in various sections. This is use of their influence in carrying moisture he region of water surfaces and their effect sing condensation of atmospheric water vapor. In the U.S., Canada, and most European countries, storm and weather charts, which indicate the probable effect of weather conditions upon commercial traffic and soil productivity, are published regularly. See also *Signal; Weather Bureau; Wind.*

Storm (*shtôrm*), THEODOR, poet and novelist, born in Husum, Schleswig, Sept. 14, 1817; died in Hademarschen, Holstein, Germany, July 4, 1888. He was educated in Kiel and Berlin and afterward settled in his native city to practice law. Because his political sympathies were with Prussia in the conflict over Schleswig-Holstein, he was exiled in 1853. With the acquisition of Husum by Prussia (1864), he returned and was awarded a district judgeship, from which he retired in 1880. As a man of letters, he is known for poetry and prose works, which show a strong affection for his native soil and a mood of gentle resignation. Of his widely read books, *"Immensee"* (1852) and *"Schimmelreiter"* (1888) are best known.

Storting (*stôr′tĭng*), the legislative body or parliament of Norway. Its 150 members are elected through proportional representation by universal suffrage for four years. At its yearly assembly, the Storting is divided by election into two sections: the *Lagting* and the *Odelsting;* laws originate in the Odelsting and must go to the Lagting for approval or rejection.

Story (*stō′rȳ*), JOSEPH, jurist and educator, born in Marblehead, Mass., Sept. 18, 1779; died in Cambridge, Sept. 10, 1845. He was graduated from Harvard in 1798, was admitted to the Massachusetts bar in 1801, and served as a Democrat in Congress from 1808 to 1809. In 1811 he was appointed an Associate Justice of the U.S. Supreme Court, which position he retained for the rest of his life. He was also (1829-45) professor of law at Harvard, where he was very influential as a teacher and in the administrative organization of the law school. He supported Chief Justice John Marshall (*q.v.*) in his efforts to establish the jurisdictional powers of the Supreme Court. Story published many books and monographs in his field. He was elected to the Hall of Fame in 1900.

Story, WILLIAM WETMORE, lawyer, poet, and sculptor, born in Salem, Mass., Feb. 12, 1819; died in Vallombroso, Italy, Oct. 7, 1895. He was a son of Joseph Story (*q.v.*) and, after his graduation from Harvard in 1838, was admitted to the Massachusetts bar. After practicing law for five years, he turned to sculpture and literature and in the middle of the 19th century settled in Rome, Italy. He gained the friendship of many literary personages of his time and published several works of his own, poetry as well as prose—in addition to juridical monographs—including "Life and Letters of Joseph Story" (1851). His contributions to English newspapers and magazines during the Civil War later appeared under the title "The American Question." His sculptures can be seen in many museums and galleries, including "Semiramis" (1874) in the Metropolitan in New York City and a statue of Chief Justice Marshall in the Capitol in Washington, D.C.

Stoss (*stōs*), VEIT, sculptor and wood carver, born in Nuremberg, Germany, in 1440(?); died in 1533. Trained in Nuremberg, he moved to Cracow, Poland, in 1477. In 1496 he returned to Nuremberg to spend the last third of his life in his native city. While in Cracow, he executed many large altar works and tombstones, best known of which is his high altar in the Marienkirche. The highly psychological characterization of persons and the meticulous detailing of faces and draperies are the outstanding features of his carvings, and his style shows clearly the transition from highest Gothic feeling to Renaissance art as it expressed itself north of the Alps.

Stoughton (*stō'tŭn*), a town in Norfolk County, Massachusetts, 18 m. s. of Boston, on the New York, New Haven & Hartford R.R. Located in a farming region, the town has manufactures of hardware, woolen textiles, machinery, shoes, and rubber goods. It was founded in 1713 and incorporated in 1743. Population, 1950, 11,146.

Stoughton, a city in Dane County, Wisconsin, *ca.* 15 m. S.E. of Madison, on the Yahara River and the Chicago, Milwaukee, St. Paul & Pacific R.R. Its chief manufactures are truck trailers and clothing. Population, 1950, 4,833.

Stoup (*stōōp*), or STOOP, or ASPERSORIUM, in ecclesiastical usage, a small basin filled with Holy Water fixed at the entrance to a Roman Catholic Church. Visitors dip their fingers into it before blessing themselves.

In Scotland and Northern England a stoup is a small liquid container holding anywhere from half a pint to two quarts.

Stout (*stout*), REX TODHUNTER, author, born Dec. 1, 1886, in Noblesville, Ind. He was a successful writer of short stories and magazine articles when his first novel, a psychological study entitled "How Like a God" appeared in 1929. In the same year he suffered losses in the stock-market crash, and to earn money quickly he wrote his first detective story. His famous detective, Nero Wolfe, did not appear until 1934, in "Fer-de-Lance." After the beginning of World War II, he abandoned detective novels for the period of the war, serving as chairman of the Writers' War Board, the Friends of Democracy, and the Society for the Prevention of World War III. In 1946, however, a new Nero Wolfe story, "The Silent Speaker," appeared. Stout's detective novels include "The League of Frightened Men" (1935), and "The Rubber Band" (1936), "Too Many Cooks" (1938), "Some Buried Caesar" (1939), "Black Orchids" (1942), and "Not Quite Dead Enough" (1944). He has invented three other detectives around whom he has built stories, but none of them has achieved even a small part of the popularity of Nero Wolfe. Stout is editor of the mystery magazine, *The Rex Stout Mystery Quarterly*.

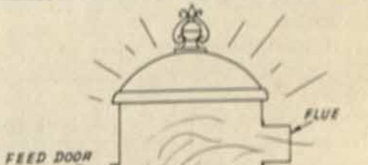
Stove (*stōv*), an apparatus usually constructed of metal and burning fuel, generally an appliance for installation above the cellar (*i.e.*, not in the basement as in the case of a furnace) for the heating of one or more rooms, or for cooking. (For cooking stoves, see *Ovens.*) The heating medium may be coal, gas, oil, wood, or other solid, gaseous, or liquid fuels.

The appliance is provided with suitable means for the control of the rate of combustion desired, for the removal of products of combustion, and, with solid fuels, for the removal of the residue (ash).

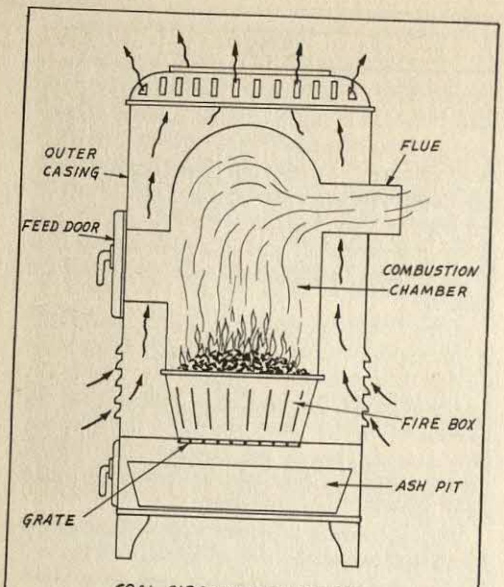
Stoves may be roughly divided into three classes: (1) those heating primarily by radiated heat; (2) those heating primarily by convectional heat; (3) those heating primarily by a combination of the two.

Stoves heating primarily by direct radiation do not generally have casings. Those heating by convectional action are provided generally with enameled casings, and the casing is designed to present a pleasing appearing and to blend in with the furnishings of the room, the general appearance being that of a cabinet.

Coal stoves consist of several basic components —the ashpit, grate, firepot, combustion chamber, fire door, and ashpit door, as well as casings and bases in the case of heaters primarily of the convectional type, and without casings in heaters



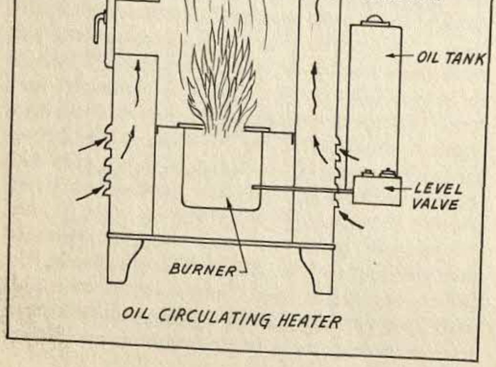
RADIATING HEATER



COAL CIRCULATING HEATER

of the radiation type. Oil stoves consist generally of the burner, combustion chamber, oil flow and control mechanisms, and fuel tank. Stoves heated by gaseous fuels consist of burner, combustion chamber, control valve and other essential elements such as legs, and casings in the convectional heaters. Thermostatic devices may be utilized for any one of the general classes of fuel.

Various other elements are found incorporated in stoves, such as magazines, fans for stimulating circulation and distribution of heated air, draft-control devices, and means for providing humidification of the heated air. (Pictures courtesy the Estate Stove Co., Hamilton, O.)



OIL CIRCULATING HEATER

HARRIET BEECHER STOWE

Stowe (*stō*), HARRIET ELIZABETH BEECHER, novelist, born in Litchfield, Conn., June 14, 1811; died in Hartford, Conn., July 1, 1896. The daughter of Lyman Beecher, minister of the Congregational Church, and the sister of Henry Ward Beecher (*q.v.*), who achieved fame as a minister and lecturer in New York, she was brought up in an intensely religious atmosphere. She attended the Litchfield Acad. and in 1824 entered the school established by her sister, Catherine, at Hartford, Conn. In 1832 she became a teacher in the Western Female Institute which Catherine founded in Cincinnati. She also began to do some writing and contributed a number of pieces to newspapers.

For a number of years after her marriage (1836) to Calvin E. Stowe, a professor in the Theological Sem. at Cincinnati, her time was taken up with the care of six children and struggles against poverty, and she found little opportunity for writing. After 1850, however, the family prospects improved considerably, for Calvin Stowe was appointed to Bowdoin Coll., Brunswick, Me., and then to the Andover Theological Sem., Andover, Mass. (1852-63). Improved in health and with more leisure, Mrs. Stowe was aroused to new literary activity by the passage of the Fugitive Slave Act (1850), making it illegal to harbor runaway slaves. Her celebrated anti-slavery novel, "Uncle Tom's Cabin, or Life among the Lowly," appeared (1852) as a serial in the *National Era,* a Washington anti-slavery paper, being published as a book later in the same year. Within a year it had reached a hitherto unheard-of sale of 300,000 copies. Although Mrs. Stowe had never declared herself an abolitionist and had not painted a particularly harsh picture of Southern slaveholders, the abolitionists immediately adopted her book as a propaganda instrument. It caused a furor all over the U.S., contributing prominently to the sectionalist movement. Within a short time, the book was dramatized and translated into several foreign languages. After the Civil War, Mrs. Stowe purchased a plantation at Mandarin, Fla., intending to help the Negroes who were migrating to that state. She also hoped to provide a business for one of her sons who had been seriously wounded in the Civil War. Although neither idea was completely successful, she continued to live there and in Hartford, Conn., for the rest of her life. She produced a number of novels and stories, largely descriptive of New England life and filled with moral and religious teaching. She also wrote religious poems and contributed to newspapers and magazines.

Strabismus (*strȧ-biz'mŭs*). See *Squinting.*

Strabo (*strā'bô*), ancient geographer, born in Pontus, Asia Minor, about 54 B.C.; died in 21 A.D. He was of Greek descent and obtained a liberal education at Amasia, in Pontus. It appears that he entered upon extensive travels soon after completing his study, visiting portions of Europe, Asia, and Africa, and by study and personal observation became qualified to prepare the most valuable geographical writings of antiquity. His geographical works appeared in 17 volumes, all but the seventh of which are still extant. In the first two books he gives an elaborate introduction, while the next eight are devoted to Europe, the six following to Asia, and the last to Africa. He published two works entitled "Continuation of Polybius" and "Historical Memoirs," but neither of them is extant.

Strachey (*strā'chê*), GILES LYTTON, biographer, born in London, England, March 1, 1880; died in Berkshire, Jan. 21, 1932. His father, Sir Richard Strachey, was a general and Anglo-Indian administrator; several members of his family were scholars and writers. Strachey attended Trinity Coll., Cambridge, where he wrote poetry and occasional reviews for literary periodicals. In 1912, he published his highly praised volume entitled "Landmarks in French Literature." He was a prominent figure in the "Bloomsbury group," a small circle of intellectuals who foregathered largely because they were friends and happened to live near each other in the Bloomsbury area of London, rather than because of common literary tendencies. The group included Virginia Woolf, the novelist, and her husband, Leonard Woolf, the publisher; Clive Bell, the art critic; Roger Fry, painter and art critic, and E.M. Forster, the writer.

Strachey is noted as the originator of a new style in biography, a style very much like fiction because of his polished wit and ability to evoke the personality of historical personages. He is vivid, clear, and interesting, if sometimes biased and somewhat fictional in his evaluations.

In 1918, he wrote "Eminent Victorians," sparkling and ironical biographies of four personalities of the Victorian age: Cardinal Manning, Florence Nightingale, Dr. Thomas Arnold, and Gen. Gordon. The book became a literary sensation. His principal work, however, is the biography, "Queen Victoria" (1921). Instead of the former overestimation of Victorianism, it initiated a more critical evaluation. Strachey's other works include "Books and Characters" (1922), "Pope" (1925), "Elizabeth and Essex" (1928), dealing with the love of the aging queen for her young favorite, "Portraits in Miniature" (1931), and "Characters and Commentaries" (1933).

Courtesy Harcourt, Brace & Co., N. Y.

LYTTON STRACHEY

Stradivari (*strä-dê-vä'rê*), or STRADIVARIUS, ANTONIO, violin maker, born in Cremona, Italy, in 1644; died there, Dec. 17, 1737. He worked under Nicolo Amati until 1700, when he became an independent violin maker. Many musical instruments of his make are carefully preserved and command high prices.

It is estimated that during his lifetime Stradivari produced more than 1,000 violins.

Strafford (*străf'ẽrd*), THOMAS WENTWORTH, 1ST BARON RABY, and 1ST EARL OF, statesman, born in London, England, April 13, 1593; executed there, May 12, 1641. Educated at Cambridge Univ., he became a member of Parliament for Yorkshire in 1614. He took little part in debate, however, until the first Parliament of Charles I, in 1625, when he emerged as a powerful speaker and a champion of Parliament against the authority of the crown. He also opposed the demand for subsidies for a war with Spain. Seeking to win the support of so effective an opponent, Charles, in 1628, created Wentworth baron and viscount and appointed him president of the Council of the North. The policy bore fruit and Wentworth reversed his stand, supporting Charles against the Parliament and incurring the deep enmity of his former colleagues. He was appointed lord deputy of Ireland in 1632 and undertook what he termed a "thorough" policy, which, while arbitrary and harsh, achieved important advances in the commercial development of the country and an end to piracy on the seas.

By 1639 Wentworth, now earl of Strafford, had become one of Charles' principal advisers. In the following year he raised an Irish army intended for use against Scotland, and this fact was used by Parliament to institute impeachment proceedings against him on the charge that he planned to use the army against England. Brought to trial in 1641, Wentworth defended himself ably. The leaders of Parliament, seeing that the charge of treason could not be sustained, introduced and passed a bill of attainder, declaring him guilty by act of Parliament. Charles sought to have the death sentence commuted to life imprisonment but ultimately signed the bill, and Wentworth was beheaded in the Tower of London.

Straight Line (*strāt līn*). See *Line*.

Straits Settlements (*strāts sĕt′t′l-mẹnts*), a former British crown colony in and about Malaya, which at its greatest extent (1912-42) included Singapore (and the Christmas and Cocos islands), Penang (including Province Wellesley and the Dindings), Malacca, and Labuan. It had an area of 1,356 sq.m., and Singapore was the capital and most important city. The soil in this area is generally fertile and the climate tropical. The people are a mixture of Malays, Asiatics, and Europeans. Among the many products of the region are sago, copra, rattan, gums, spices, and fruits. Tin and rubber are the chief exports. Few railroads were built, but the colony developed several fine canals and constructed many miles of improved roads. The population, including Chinese, Malays, Europeans, etc., totaled 1,435,895 in 1941.

Formed in 1826 by the British East India Co., the colony originally included Penang, Malacca, and Singapore. After the company was dissolved in 1858, the settlements were under the India Office, and in 1867 they became a separate crown colony. Labuan joined it in 1912. During World War II the colony was occupied by the Japanese. The invasion of Malaya spread southward through the peninsula until the last stronghold, Singapore, fell on Feb. 15, 1942. In October 1945, following the end of World War II, the British government undertook a reorganization of the government of Malaya. The settlement of Singapore was constituted a separate crown colony in 1946 and in 1958 became a self-governing British protectorate. Penang and Malacca were attached to the Union of Malaya, which in February 1948 became the constitutional Federation of Malaya, consisting of nine states in the Malay Peninsula and the two British settlements, with separate citizenship of its own. Labuan went to British North Borneo. See also *Malaya*.

Stramonium (*strạ-mō′nĭ-ŭm*) or STRAMONY, a weedy plant (*Datura stramonium*) of the potato family, whose leaves yield a narcotic poison (also called stramonium) similar to belladonna. It is used as a medicine, chiefly for the relief of asthma. The plant, originally tropical but now naturalized all over the world, grows from 1 ft. to 5 ft. high, with large flowers, spiny fruits, and foul-smelling leaves. See also *Jimson Weed*.

Strang (*străng*), JAMES JESSE, Mormon leader, born in Scipio, N.Y., March 21, 1813; died near Burlington, Wis., July 9, 1856. He was a lawyer and a teacher before he migrated (1843) to Wisconsin and was converted to Mormonism. On the death (1844) of Joseph Smith, the Mormon leader, Strang claimed the succession by proclaiming himself a prophet through a vision of God and was excommunicated shortly after. He organized a colony near Burlington, Wis., called Voree, which attracted the Mormons who did not accept the leadership of Brigham Young. In 1847 he moved his colony to Beaver Island in Lake Michigan and set up a despotic rule. On the complaints of his neighbors, the Federal government brought several charges against him, unsuccessfully. In 1850 he was crowned King James and later was elected to the Michigan house of representatives. He was assassinated in 1856 and his colony dispersed.

Strange Interlude (*strānj ĭn′tẽr-lūd*), a play by Eugene O'Neill (*q.v.*), in two parts and nine acts, which won the 1928 Pulitzer Prize for drama. The play uses the stream-of-consciousness technique, presenting not only the customary stage dialogue but the audible thoughts of the characters as well.

Strasbourg (*străs′bûrg*), in German, STRASSBURG, a city in France, capital of the Bas-Rhin department, in Alsace. It is located on the Ill River, 2 m. w. of its junction with the Rhine and near the German border. It is the industrial and cultural center of the region, with extensive rail and port facilities. The Rhine-Rhone and Rhine-Marne canals afford water connections with the Mediterranean and the Atlantic. The port clears iron ore from Lorraine, coal from the Ruhr, Alsatian potash, cereals, and metal and food products. Chief industries are metal working (automobiles and rolling stock), construction, flour milling, brewing, distilling, and tanning. Manufactures include paper, carpets, musical and surgical instruments, furniture, chemicals, and tobacco. The region is noted for its *pâté de foie gras* and its Alsatian hops and wine. Its printing houses were among the earliest and most famous in Europe. (Gutenberg is supposed to have perfected his printing press in Strasbourg.)

The old section of the city, built on an island between the two arms of the Ill, contains the cathedral, or Münster, one of the most famous works of Gothic architecture. A Romanesque crypt was begun in 1015, but the rest of the church—the large nave, the stained-glass rose window, the 466-ft. spire (one of the tallest in Europe)—is Gothic and unites French and German architectural influences. In the southern transept is a famous astronomical clock. For a picture of the cathedral, see *Architecture*.

Among the other noteworthy buildings are the chamber of commerce building, a fine example of Renaissance architecture; the Notre Dame Museum, housing a collection of art works; and the Rohan Palace (1730-42), formerly an episcopal palace and now a museum. The university, dating from 1538, when Johannes Sturm combined three existing elementary schools, was recognized as an academy by Emperor Maximilian II in 1566. In 1621 it became a university, with faculties of medicine, science, letters, and theology. Between 1872 and 1919 it was known as Kaiser Wilhelm Universität, but after World War I it was reorganized by the French government. In the new section of the city, there is Europe House, the seat of the European Assembly (see *Europe, Council of*).

The city existed in Roman times, being known as Argentoratum. In 455 it was destroyed by the Huns and later rebuilt; after 855 it became part of the Holy Roman Empire and in 1201 received the status of an imperial town. It was taken by France in 1681; and in 1871, after the Franco-Prussian War, it went to Germany. It was returned to France in 1919 but was occupied by the Germans from 1940 to 1944. Population, 1954, 200,921.

Strasbourg, OATH OF, an oath taken in 842 on the plain of Strasbourg, France, by Charles the Bald (Charles II) and Louis the German (Louis II) in an alliance against their brother, Emperor Lothair I. The document, preserved at Paris, has historical significance in that it records the oath both in French and German and is the earliest known example of French.

Strategy (*străt′ė-jĭ*). See *Tactics*.

Stratford (*străt′fẽrd*), a residential and resort town in Connecticut, on Long Island Sound at the mouth of the Housatonic River, 3 m. E. of Bridgeport. It is served by the New York, New Haven & Hartford R.R. Famous in its early days for shipbuilding and oyster fisheries, Stratford now manufactures aircraft, asbestos, metal products, brake linings, plastic and paper products, and machinery. Settled in 1639 and named for the English town of Stratford-on-Avon, it has many fine examples of 18th-century architecture. The American Shakespeare Festival Theatre and Acad. was established here in 1955. Population, 1950, 33,428.

Stratford, home of the Lee family in Westmoreland County, Virginia, on the Potomac River, 35 m. S.E. of Fredericksburg. A national shrine since 1935, it was built (1729-30) by Thomas Lee and was the birthplace of Richard Henry Lee, Francis Lightfoot Lee, and Robert E. Lee and the home of "Light-Horse Harry" Lee. Antebellum activities—spinning, weaving, curing hams, and grinding meal—are still carried on there.

Stratford, a city in the Province of Ontario, Canada, seat of Perth County, on the Avon River, 80 m. s.w. of Toronto. Located on the Canadian National Ry., it has locomotive-repair shops and woolen and knitting mills. Its manufactures include furniture, leather and rubber products, clothing, agricultural machinery, cigars, and food products. As the home of the Stratford Shakespearean Festival, it is one of the centers of Canadian drama and music. Surveyed by the Canada Co. in 1834, it became a town in 1858 and was incorporated as a city in 1884. Population, 1956, 19,802.

Stratford de Redcliffe (*străt′fẽrd dē rĕd′klĭf*), STRATFORD CANNING, 1ST VISCOUNT, diplomat, born in London, England, Nov. 4, 1786; died in England, Aug. 14, 1880. He studied at Cambridge Univ. and in 1807 became secretary to his cousin George Canning (*q.v.*), who had been appointed foreign secretary. In 1808 he was made secretary at the British embassy in Constantinople, Turkey, and two years later became chargé d'affaires. In the latter capacity, he negotiated the peace of Bucharest (1812) between Turkey and Russia, thus releasing the czarist army to oppose Napoleon's invasion. He was appointed minister to Switzerland in 1814, served as commissioner at the Congress of Vienna in 1815, and from 1819 to 1823 was minister to the U.S. In 1824 he was made ambassador to Turkey, where he promoted the independence of Greece. From 1828 to 1841 he was a member of the Parliament. He was again in Constantinople from 1842 to 1858, including the time of the Crimean War. His diplomacy brought about numerous reforms, especially liberalization of restrictions the Turkish government had placed on the Christian minority. He was raised to the peerage in 1852. In addition to publishing a number of poems, he wrote "Why I Am a Chrstian" (1873), "Alfred the Great at Athelney" (a play, 1876), and "The Eastern Question" (a series of essays, 1881). A monument to him was erected (1884) in Westminster Abbey.

Stratford-on-Avon (*străt′fẽrd-ŏn-ā′vŭn*), a market town and municipal borough of England, situated in Warwickshire, 8 m. s.w. of Warwick, on the Avon River. The city is served by main railway lines. It is noted as the birthplace of Shakespeare, and the house believed to be his birthplace (held in trust for the nation) has been

Courtesy British Information Services, N.Y.

SHAKESPEARE'S BIRTHPLACE

At Stratford-on-Avon, England

restored to look as it did in Shakespeare's time. His burial place is in the Church of the Holy Trinity, which also has a monument and bust of him and a stained-glass window representing the seven ages of man. During the annual summer Festival Season, the plays of Shakespeare are performed in the theater of the Shakespeare Memorial Bldg. Opened in 1877, the first theater burned down in 1926 and was rebuilt in 1932 at a cost of more than $1,000,000. Other places of interest are the cottage of Anne Hathaway and the houses of Shakespeare's mother and his daughters. Tourists are the town's chief source of income. Population, 1951, 14,980.

Strathcona and Mount Royal (*străth-ḳō'nȧ, mount roi'ạl*), DONALD ALEXANDER SMITH, 1ST BARON, statesman, born at Forres, Scotland, Aug. 6, 1820; died in London, Jan. 21, 1914. In 1838 he entered the employ of the Hudson's Bay Co. For some time he was stationed on the coast of Labrador and in the Northwest, and was the last resident governor of that corporation as a governing body. During the Riel rebellion he was special commissioner (see *Riel, Louis*). In 1870 he was elected to the first session of the legislature in Manitoba, and in 1871 to the Canadian House of Commons, where he served for nearly 25 years and was a factor in directing attention to the needs and possibilities of the Red River settlements. He was a promoter and director of numerous banking and railway corporations, chancellor of the Univ. of Aberdeen, and did much to promote the development of the western part of Canada. Queen Victoria knighted him in 1886 and made him a peer in 1897.

Stratification (*străt-ĭ-fĭ-ḳā'shŭn*), a primary structure of sedimentary rocks, caused by the deposition of layer after layer of different or alternating types of sediment. Each layer, or stratum, represents a period of time during which the conditions of deposition were uniform and may vary in thickness from only a fraction of an inch to hundreds of feet. Rocks commonly showing stratification are sandstone, shale, and limestone, whose component sediments were laid down on the shores of the seas or in the beds of rivers and lakes by the action of moving water. Other stratified rocks, very restricted in occurrence, are made up of dust and sand which have been transported by winds. When strata are deposited one upon another in unbroken succession and without disturbance, they are said to be *conformable*. When, however, one set of beds is deposited on another which has been above the sea and there eroded, the two beds are *unconformable*, and an *unconformity*, represented by the erosion surface which separates the strata, is said to exist. Originally most sediments were deposited over flat, very slightly inclined surfaces. In many regions, however, due to compressional forces, great thicknesses of strata have been tilted so that they are said to *dip*, the angle of dip being the departure from the horizontal. The direction at right angles to the dip is known as the *striḳe* of a bed or stratum.

Stratosphere (*străt'ō-sfēr*). See *Atmosphere; Aviation.*

Stratton (*stră'tŭn*), SAMUEL WESLEY, physicist and University president, born in Litchfield, Ill., July 18, 1861; died in Boston, Oct. 18, 1931. Stratton resigned as professor of physics at the Univ. of Chicago in 1901, when he was requested to prepare a report on a proposed national bureau of standards. He drafted the Congressional bill which established the bureau and then became its first director (1901-23); he was later appointed a member of the International Commission on Weights and Measures. In 1923 he accepted the presidency of the Mass. Institute of Technology. His principal claim to fame is his founding of the Bureau of Standards (*q.v.*).

Straus (*strous*), OSCAR SOLOMON, jurist and public official, born in Otterberg, Germany, Dec. 23, 1850; died in New York City, May 3, 1926. He was brought to the U.S. in 1854 and lived in Georgia until after the Civil War. After graduation (1871) from Columbia Coll., he was admitted to the bar, and subsequently practiced law and engaged in business. In 1887 he was appointed minister to Turkey by President Cleveland. President Theodore Roosevelt made him a member of the permanent court of arbitration at The Hague, in 1902, as successor to President Harrison. He succeeded Victor H. Metcalf as Secretary of the Dept. of Commerce and Labor in 1897. He wrote a number of books about the U.S. and the functioning of its government.

Straus (*shtrous*), OSKAR, composer, born in Vienna, Austria, April 6, 1870; died in Bad Ischl, Jan. 11, 1954. He began to conduct while still young, directing theater orchestras in Germany and Austria from 1895 to 1900. Thereafter he devoted himself to composition. His first success came with the operetta "Waltz Dream" (1907), followed with the even greater success of "The Chocolate Soldier" (1908), an operetta adapted from Shaw's play "Arms and the Man." Straus lived in Paris from 1927 to 1940, when he came to the U.S. His operettas, which have long been popular in Europe and America, include "The Little Friend," "All Around Love," "My Lady's Glove," "Mariette," and "Three Waltzes." He also composed the music for several of Maurice Chevalier's motion pictures, including "The Smiling Lieutenant" and "One Hour With You." Although Straus has written some serious music, his fame comes chiefly from his operettas.

Strauss (*shtrous*), DAVID FRIEDRICH, theologian, born at Ludwigsburg, near Stuttgart, Germany, Jan. 27, 1808; died at Darmstadt, Feb. 8, 1874. He was educated at the Univ. of Tübingen. After his graduation, he taught first at Maulbronn, Germany, and then was appointed to the Univ. of Zurich, but, because of the furor caused by his writings, was compelled to resign, in 1839, before he assumed his duties.

Strauss was greatly influenced by Hegel's philosophy, and his best-known work, "The Life of Jesus" (1835-36), is an interpretation of Christ's life based on Hegelian concepts. In the book, Strauss attempts to show that, except for a few basic biographical details, the life of Christ as told in the Gospels represents the expression of the Messianic hopes of His followers rather than actual fact. This work was revolutionary in that Strauss for the first time used on the Holy Scriptures the same kind of analysis of the myth (*mythos*) as had previously been used in the study of Greek archaeology. In other words, he represented part of the contents of the Gospels as fictitious, as wishful thinking on the part of the Jews who wanted to explain the appearance of Christ as the fulfilled promise of the Messiah.

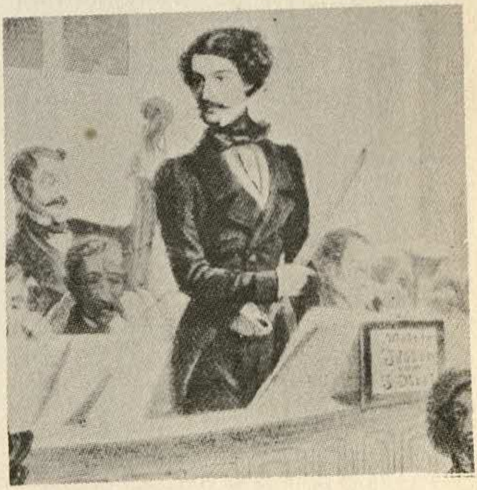
DAVID FRIEDRICH STRAUSS

The sensation this work created can hardly be imagined today. Hundreds of polemical brochures against it appeared, written by almost all the leading theologians and philosophers of the day. Strauss answered, and finally in 1840-41 published *"Die Christliche Glaubenslehre,"* a comprehensive history of Christian doctrines. In this work, he analyzed and criticized the individual dogmas of Christianity by narrating their historical development and the human influences on their formulation.

His last work, "The Old Faith and the New: A Confession," appeared in 1872. In it he definitely refuted all of Christianity and confessed to completely materialistic monism, taking back even such concessions as he had previously made to liberal Protestantism.

Strauss, JOHANN, composer and orchestral conductor, born in Vienna, March 14, 1804; died there Sept. 25, 1849. He began to play the violin when a mere child and in 1819 secured an engagement as violinist at the Sperl Theater in Leopoldstadt. In 1826 he introduced his famous orchestra to the public of Vienna and soon made an extended tour through northern Europe, meeting with brilliant success in the principal cities. He visited Great Britain for an extended tour in 1849, but soon returned to Vienna, where he died of scarlet fever.

Strauss, JOHANN, composer, son of the former, born in Vienna, Austria, Oct. 25, 1825; died there June 3, 1899. He succeeded his father as manager of the famous Strauss orchestra, with which he traveled in most of the countries of Europe. In 1872 he came to America to conduct an orchestra of 1,000 performers at the Boston Peace Jubilee, and while in the U.S. played with remarkable success in many of the principal cities. The 50th anniversary of his debut in Vienna was celebrated with great pomp in 1894. He was



JOHANN STRAUSS THE YOUNGER

for many years music director to the emperor at Vienna. Both he and his father are notable Austrian composers of the 19th century, and some of their music is still quite popular. Besides composing over 400 waltzes, he wrote numerous operettas, including *"Die Fledermaus"* (1874), in the English version known as "The Bat"; "A Night in Venice" (1883); "Gypsy Baron" (1885); and "Prince Methusaleh" (1887).

Strauss (*strąs*), LEWIS LICHTENSTEIN, investment banker, public official, born in Charleston, W. Va., Jan. 31, 1896. He was educated at the Medical Coll. of Virginia, the Jewish Theological Sem., Columbia Univ., and other institutions of higher learning. He joined the firm of Kuhn, Loeb & Co. in 1919 and was a partner from 1929 to 1946. A member of the U.S. Navy Reserve, he was promoted to rear admiral in 1945. Strauss served as a commissioner (1946-50) and as chairman (1953-58) of the Atomic Energy Commission. As a commissioner, he advanced the preparation of the H-bomb. President Eisenhower's recess appointment of Strauss as Secretary of Commerce, on Nov. 10, 1958, was rejected by the U.S. Senate (49-46) on June 19, 1959.

Strauss (*shtrous*), RICHARD, composer, born in Munich, Germany, June 11, 1864; died in Garmisch-Partenkirchen, Sept. 8, 1949. He began the study of music and mastered the piano and violin while still quite young. In 1885 he was appointed conductor of the Court Opera in Munich, a position he held until 1889, when he took a similar post in Weimar. In 1898 he became associated with, and was later the leading conductor of, the Royal Opera in Berlin. In his early work, Strauss composed in the style of Richard Wagner, but he gradually found his own style. In his epoch, Strauss' compositions were as revolutionary as Wagner's had been in the second part of the 19th century. Strauss' musical innovations were primarily concerned with instrumentation, and he developed new harmonies of an unprecedented boldness as well as new structural forms. These features became especially apparent in his symphonic tone poems, which combine programmatic narration with musical expression (program music). His chief orchestral works include "Don Juan" (1888), "Death and Transfiguration" (1890), "Till Eulenspiegel" (1895), "Thus Spake Zarathustra" (1896), and "A Hero's Life" (1898). His *"Sinfonia Domestica"* (Symphonic Poems, 1904) is greatly admired, as are his operas (most of them from libretti by the Austrian poet Hugo van Hofmannsthal) *"Feuersnot"* (1901), "Salome" (1905), and "Elektra" (1908). Foremost, however, is his opera *"Der Rosenkavalier"* (1911), whose splendid arias and waltzes have attained great popularity. He is also famous as the greatest composer of *lieder* (see *Lied*) after Brahms and Hugo Wolf.

Courtesy Musical Courier, N. Y.

RICHARD STRAUSS

Stravinsky (*strą-vĭn′skē*), IGOR FĚDOROVICH, composer and conductor, born in Oranienbaum, Russia, June 17, 1882. He studied law at St. Petersburg (later Leningrad) Univ., but abandoned it to study (1907) composition with N. A. Rimsky-Korsakov (*q.v.*). His 20-year association with the impresario S. P. Diaghilev (*q.v.*) resulted in his best-known ballets: "The Firebird" (1910), "Petrouchka" (1911), and "The Rite of Spring" (1913), danced by V. N. Nijinsky (*q.v.*). Other ballets include *"Apollon musagète"* (1927), *"Le Baiser de la fée"* (1928), "Persephone" (1933), "Card Party" (1937), "Orpheus" (1948), and "Agon" (1957), which won the 1957 Music Critics Award.

Stravinsky is also the composer of orchestral, piano, and chamber music works, and of operas. These include *"L'Histoire du soldat"* (1918); "Oedipus Rex" (1927); "Symphony of Psalms" (1930); "The Rake's Progress" (1951), based on William Hogarth engravings, with libretto by W. H. Auden and Chester Kallman; *"Canticum Sacrum"* (1956); "The Star-Faced One" (1957); and "Threni" (1959), set to Latin excerpts from the prophet Jeremiah.

Although a citizen of France after 1934, Stravinsky settled permanently in the U.S. and became a naturalized citizen in 1945. In 1939-40 he held the Charles Eliot Norton chair of poetry at Harvard, later publishing his lectures under the title "Poetics of Music." He is also the author of "Chronicles of My Life" (1936) and "Conversations with Igor Stravinsky" (with Robert Craft, 1959). In 1951 he was awarded the gold medal for music by the National Inst. of Arts and Letters, and in 1956 he was elected to the American Acad. of Arts and Letters. He received (1958) the first International Award of the Philadelphia Acad. of Music and other awards.

Straw (*strạ*), the name applied to the slender dry stems of various crops which have been grown for grain or seed, especially the small grains These stems remain after the grain has been threshed out, and special machines are used to mow and bale the straw.

Straw finds its most extensive use as bedding for animals, particularly on the farm and in cattle shipment, and as the raw material for various types of paper. It has relatively little value as stock feed, because, in ripening, plants send nearly all their food material into the grain.

About 400,000 tons of straw are turned into strawboard, corrugated board, etc. every year, and smaller quantities are used in the manufacture of straw (not Panama) hats and of matting. The largest quantity is used in making wrapping paper and packing paper products. Since 1937, the straw of seed flax has been used to manufacture cigarette paper.

Strawberry (*strạ'bĕr-ĭ*), the fruit and about 20 species of the genus *Fragaria,* in the rose family Three of the species have been much cultivated, and many varieties have been developed from them. From the European *Fragaria vesca* come the "ever-bearing" varieties, which yield two crops a year. From the eastern American (*Fragaria virginica*) and the western mountain (*Fragaria chiloensis*) species, nearly all the market varieties have been derived.

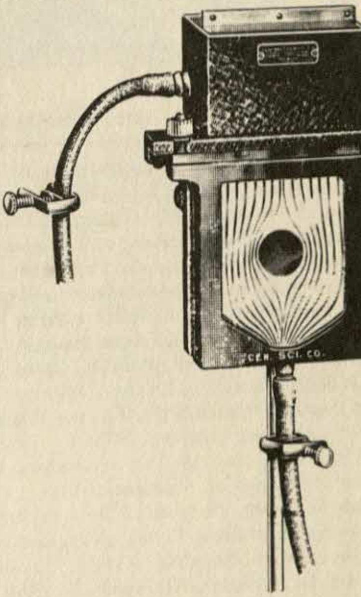
Strawberry plants are low-growing: they have a tuft of leaves, each with three leaflets. The flowers are usually white and borne in small clusters. The fruits are not true berries, botanically. The edible part is the much swollen top of the flower stems, while the real fruits are the little specks on its surface, each with one seed.

Cultivated types of strawberries are raised from small offshoots which form on the long slender runners. A single plant may give rise to as many as 50 new plants in a year. In northern regions, the plants need the winter protection of a mulch of straw, or similar cover, several inches thick.

The strawberry crop is the biggest of all the berry crops in the U.S. Some 25 per cent of the whole crop is frozen.

Strawflower (*strạ'flou-ẽr*), an annual, flowering plant; an Australian species (*Helichrysum bracteatum*) of the sunflower (composite) family. The flower heads come in every color except blue and retain their colors when dried. These colors are not in the actual small flowers of the heads, however, but in the surrounding bracts—or scaly parts—which in other flowers of this family are green. The plants grow about 2½ ft. tall, with some branching; the 4-to-5-in. leaves taper below. See *Everlasting Flower.*

Streamlines (*strēm'līnz*), the lines showing the path of a fluid as it moves around a solid object. The illustration pictures the streamlines of a fluid passing a sphere, separating before the sphere and converging after passing it. Fluids passing a smooth object produce curved streamlines, but irregular objects disturb the flow and distort the lines. When the speed of the fluid becomes great, the streamlines break up and the flow is said to be turbulent. Since the path of the fluid describes the line of least resistance to external pressure, similarly designed bodies reduce the resistance of air or water to motion. The determining of streamlines is therefore of great importance in marine and aeronautical design, and to a lesser extent in the design of land vehicles such as automobiles and railway trains.



Courtesy Central Scientific Co., Chicago

STREAMLINES OF FLUID PASSING A SPHERE

In modern industrial design, the term is used to designate objects so shaped that when in motion, liquids, or gas (air), will flow smoothly in an unbroken pattern around them. Thus the objects offer the least possible resistance to the medium in which they move. The term is also applied to stationary objects, such as furniture or decorative pieces, designed to have the form of streamlined objects of motion.

Stream of Consciousness (*strēm ŏf kŏn'-shŭs-nẹs*), a literary technique in which character and events are disclosed through an internal monologue, the continuous and spontaneous flow of thoughts, sensations, memories, associations and emotional reactions of an individual. This technique is typified in the novel "Ulysses," whose author, James Joyce (*q.v.*), has carried it to its

Courtesy Capital Transit Co., Wash., D. C.

HORSE-DRAWN STREETCAR OF THE 1880'S

logical, but sometimes unintelligible, extreme in "Finnegans Wake" (1939). This style had early forerunners in the work of Herman Melville, Edgar Allan Poe, Henry James, and Laurence Sterne; and while Joyce is the chief exponent of the true stream-of-consciousness style, it has been adapted and employed in a modified version by many of his followers. Among those strongly influenced by it are Sherwood Anderson, James T. Farrell, William Faulkner, Ernest Hemingway, John Dos Passos, Gertrude Stein, Thomas Wolfe, Virginia Woolf, and Eugene O'Neill, whose "Strange Interlude" (1927) was an attempt to utilize the technique in dramatic form.

Streator (*strē′tẽr*), a city in La Salle County, Illinois, on the Vermilion River, 90 m. s.w. of Chicago, in a clay-producing district. On the Wabash and the Chicago, Burlington & Quincy R.R.'s, the city is surrounded by an agricultural region. The highly industrialized city manufactures bottles, glass, brick, tile, sewer pipe, and foundry products. Streator was settled in 1860 and incorporated as a city in 1882. Population, 1940, 14,930; in 1950, 16,469.

Street Railway (*strēt rāl′wā*), the general name for a railway operated entirely or in part upon the streets of towns or cities, designed principally for the transport of passengers. This form of transportation was developed from the tramway, which was constructed of wooden stringers covered with strips of iron; cars were drawn by horse or steam power. In Great Britain, street railways are still generally called tramways.

The first street railway in North America was built in New York City. On Nov. 14, 1832, it was opened between Prince St. and 14th St. along the Bowery. It was operated as a horsecar line for many years. Though the cars were small and the speed was comparatively slow, the line was pronounced a success. Similar railways were soon constructed in New Orleans (1835), Brooklyn (1853), Boston-Cambridge (1856), Philadelphia (1858), and Cincinnati, Baltimore, and Chicago (1859), as well as in Berlin, Paris, and London.

Street railways operated by moving lines of cable (see *Cable Cars*) were first introduced at San Francisco in 1873, where they proved eminently satisfactory for climbing and descending the extremely steep hills. The motive power in railways of this kind is furnished by a stationary steam engine located at a central point, by which an endless wire cable, guided by suitable pulleys, is moved or driven at a rapid speed. This cable runs in an underground conduit between the rails and a grip projects downward from the bottom of the car through a slot in the conduit. At the lower end of the grip are jaws that can be operated from the platform of the car. When the jaws grasp the cable, the car moves forward upon the track, and it is stopped by releasing the jaws. Some of the larger cities installed systems of cable cars, but they were never in wide use and are now used only in San Francisco and on some mountain slopes (for sightseeing or ski tows).

The electric railway (*q.v.*) followed the cable car as the next passenger transit vehicle. In Richmond, Va., a system was devised in 1887 using an overhead power supply. Current was taken from an overhead wire by a wheel carried on top of a movable pole attached to the middle of the car's roof. Running rails were used for the return electrical current and a motor was mounted on the car. Some cities, such as New York and Washington, D.C., on replacing cable cars by electric trolley cars, laid the power lines in the old cable conduits to avoid the unsightliness and danger of the overhead wire system. The electric street railway was so popular that by 1917 there were 80,000 passenger cars, running on 45,000 m. of track.

After the outbreak of World War I, the electric railway was challenged by the "jitney," a private car traveling the railway route and charging the same fare (usually 5¢). This was the forerunner of the trolley bus and motorbus that later came to dominate surface transportation in U.S. cities. By 1954 there were fewer than 7,000 cars in use on street railways, and most of the lines had been replaced by other systems (subway or bus). See also *Trolley Car*.